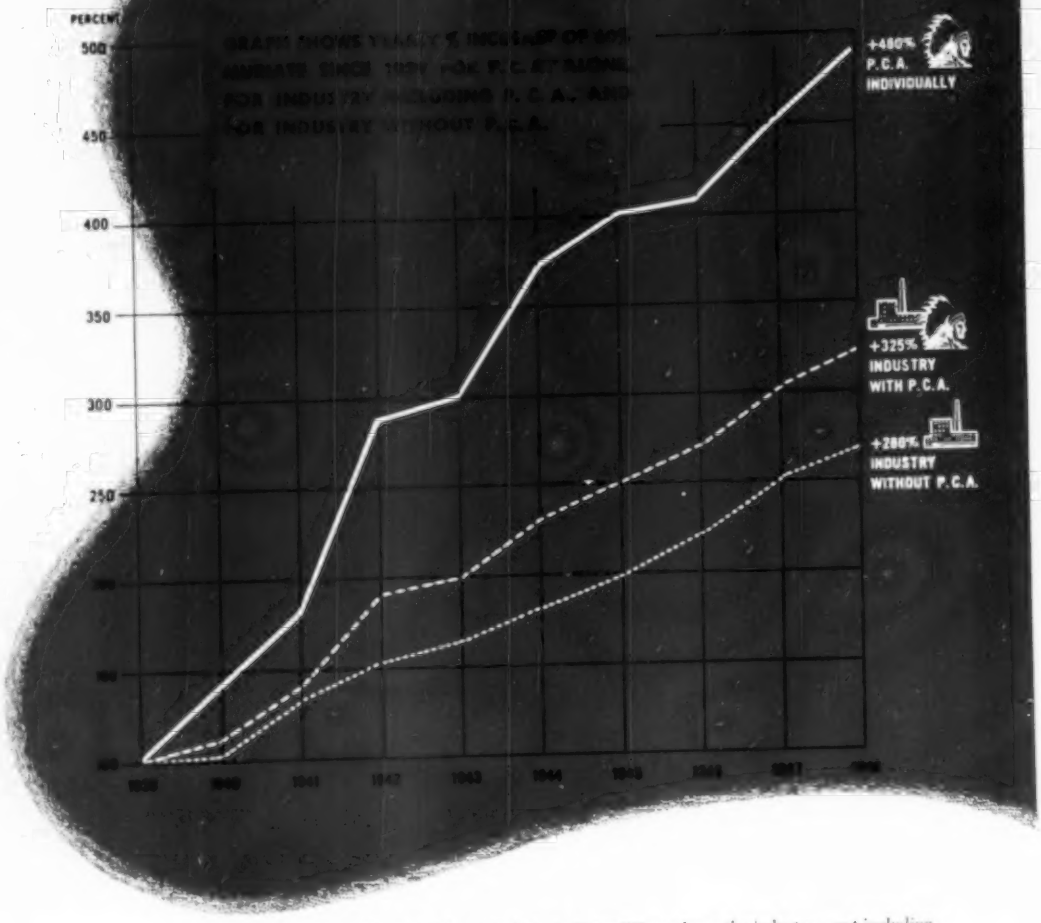
AGRICULTURAL CHEMICALS

We've been doing some figuring . . .



1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 288% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

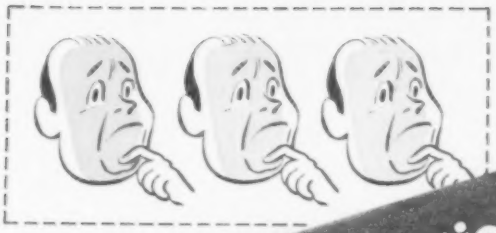
95% of all P.C.A.'s '48 deliveries were in the form of 60% Muriate. Our new $1,000,000 production and refining facilities now are operating. Our deliveries for '49-'50 will break all previous records. In fact, P.C.A.'s production capacity for 60% Muriate this year will exceed by some 150,000 tons the entire potash consumption — all grades — of the nation ten years ago.

These figures are graphic evidence of the leadership P.C.A. has won . . . leadership in volume, in economy to you and to agriculture.

P.C.A.
The SALT of the EARTH
RED MURIATE

Potash Company of America
Carlsbad, New Mexico

GENERAL SALES OFFICE . . 50 Broadway, New York, N. Y. ● MIDWESTERN SALES OFFICE . . First National Bank Bldg., Peoria, Ill.
SOUTHERN SALES OFFICE . . Candler Building, Atlanta, Ga.



Formulation Problems *Solved Profitably* with ATTACLAY

Today, Attaclay—the unique carrier and diluent—is used by practically all of the nation's larger producers of pesticide dust concentrates.

There are good reasons why. When free-flowing, highly sorptive Attaclay is in the formula, the capacity of mills—and that of the rest of the dust-handling equipment—goes up as much as 50%. Attaclay transmits its own natural fluidity and lump-free fluffiness to the product, making each item more desirable—more sellable. Which is another way of saying that Attaclay has proven its ability to reduce production costs, improve products, widen profit margins.

Blenders, too, recognize Attaclay's advantages. In the months to come —when they extend concentrates to field-strength dusts—Attaclay, applied as diluent, will continue to reshape ideas of what a fine, non-abrasive finished dust should be.

So, if you have a carrier or diluent problem and want to be sure of solving it *profitably*, discuss it with us. We will gladly provide a generous working sample of Attaclay and technical help.

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.

Powco Brand

Allethrin*

The much-talked-about "synthetic pyrethrum" – really the allyl homolog of Cinerin I, a pyrethrum-*like* organic – is now available in limited quantities.

Industry's chemists and entomologists are continuing their tests of this new insecticide material. Large-scale production quantities probably will not be available until 1951.

Meanwhile, small quantities of this interesting and promising compound will enable you to try it out in your own formulations – become familiar with its properties – and thereby prepare yourself to take *full* advantage of it when larger supplies are available.

As always, our chemists and entomologists will work closely with you in developing your own formulations of POWCO BRAND ALLETHRIN.

For dependable progress in insecticide materials – look to Powell!

ALLETHRIN
DDT POWDERS AND LIQUIDS
CHLORDANE POWDERS AND LIQUIDS
PYRETHRUM POWDERS AND EXTRACTS
PYRINS
AEROSOL FORMULATIONS
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PYRISCENTS (insecticide perfumes)
BOTANICALS • ROTENONE • SABADILLA
ANTU
2,4-D AND INPC WEED KILLERS
BHC POWDERS AND LIQUIDS
COTTON DUST CONCENTRATES
TOXAPHENE POWDERS AND LIQUIDS
TETRAETHYL PYROPHOSPHATE

*Coined name suggested for allyl homolog of Cinerin I by Interdepartment Committee on Pest Control Materials.

POWCO BRAND

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AGRICULTURAL CHEMICALS

A Monthly Magazine For the Trade

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THIS MONTH'S COVER

Pre-emergence weed spraying by airplane has proved successful. Flagman at the end of the field marks course over onion field as a low-volume application of herbicide comes from plane. Heavy rain had left field too wet for ground rig. A few days after air application, young onions emerged in weed-free plot. (See Petroleum Herbicides article, page 31. Photo courtesy of author.)

APRIL 1950

VOL. V No. 4

In This Issue:

AGRICULTURAL CHEMICALS

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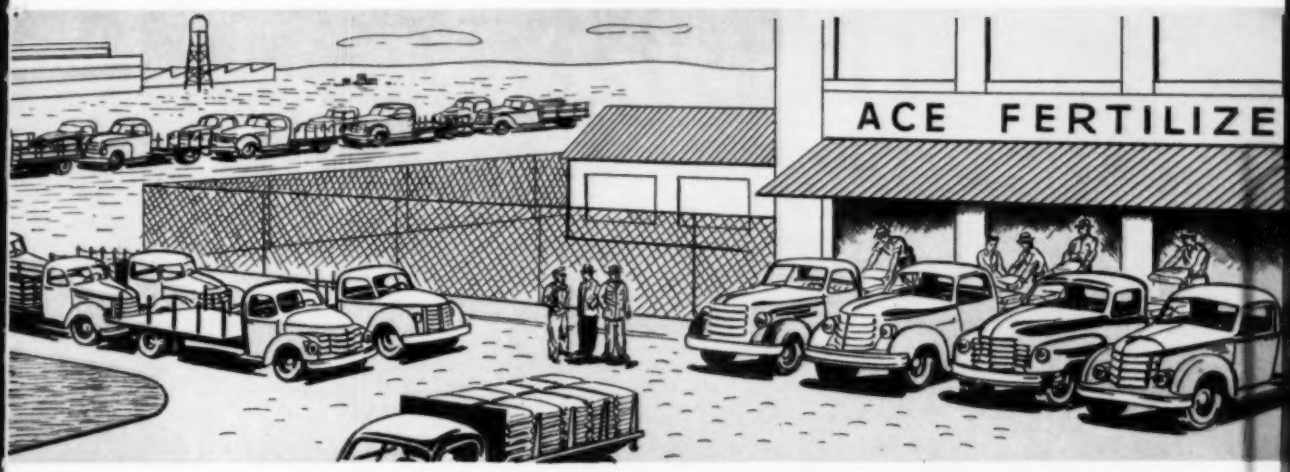
Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

MAKE MORE MONEY
IN YOUR RUSH SEASON
WITH ST. REGIS MULTIWALLS

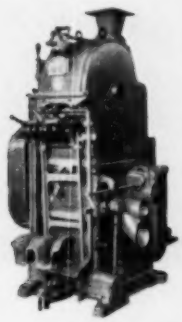


Bigger tonnage per *man-hour*—sure, fast bag deliveries—and prompt, dependable engineering service are among the reasons why so many plants use St. Regis Multiwall Paper Bags and packers.

The high quality of St. Regis Multiwall Bags shows up in their uniformly good performance on the packers and their resistance to moisture.

You are going to have rush seasons in the future, the same as this spring—take no chances on delayed Multiwall deliveries to your plant. That is when you need to depend on the quality of every bag and packing machine, to help you turn out the biggest possible tonnage, in the least time, at lowest cost.

Let the St. Regis Sales Office nearest you make a survey of your plant and give recommendations that may boost your production and cut your packing cost.



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YOU BUY PROTECTION WHEN YOU BUY MULTIWALLS

CRAG Trade-Mark fungicides offer new PROFIT POSSIBILITIES in the farm market

Add to your list of agricultural chemicals CRAG Fruit Fungicide and CRAG Potato Fungicide. These chemicals give consistent disease control, assuring better yields and more marketable products.

CRAG Fruit Fungicide (341C) gives outstanding control of apple scab and prevents European red mite build-up when used in a complete post-bloom program. It produces healthier foliage, better quality fruit, and has these *other* sales advantages:

- Easy to dilute and apply
- Require no special additives
- Minimum toxicity hazard
- Unusually good spreading and tenacity
- Compatibility with most insecticides
- Simplifies spray schedules

CRAG Potato Fungicide (658) gives dependable control of early blight and late blight. It can be used as a spray or in a dust formulation. It is readily dispersed in spray tanks—no additives are needed. It stays in suspension—thus providing for uniform foliage coverage. This fungicide has these *additional* sales advantages:

- Chemically stable on foliage and in storage
- Weather resistant
- Compatible with DDT
- Easily formulated

Availability: CRAG Fruit Fungicide and CRAG Potato Fungicide are available from leading agricultural chemical distributors. Ask your distributor for samples and further technical information or write direct to us.

"Crag" is a registered trade-mark of Union Carbide and Carbon Corporation

Producers of Agricultural Chemicals—including:

CRAG Turf Fungicide—
for treatment of "dollar spot."

CRAG Fly Repellent—
for protection of livestock.

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NEW ACCESSORIES
FOR THE
BECKMAN "DU"
SPECTROPHOTOMETER
Long the standard research spectrophotometer for ultraviolet, visible and near-infrared measurements, the Beckman "DU" assumes even greater usefulness through the development of new accessory equipment.
Most recent additions to the diversified line of accessories are the four described at right. Detailed information on these and other accessories will be gladly sent on request. Beckman Instruments, National Technical Laboratories, South Pasadena 13, Calif.
BECKMAN INSTRUMENTS
control modern industries
Radiation Meters—Special Analytical Instruments
pH Meters and Electrodes—Spectrophotometers
TEST TUBE HOLDER
Simplifies direct measurement of samples in round test tubes
A metal carriage rigidly holds test tubes from 10 mm to 25 mm (1") in diameter in special lightproof housing. A single holder accommodates the various sizes of test tubes and allows exact relocation of tubes horizontally, vertically and rotationally. An accessory unit also permits use of 2" beakers interchangeably in the same carriage.
Designed for oil chemistry; Vitamin "A" analyses; clinical and medical applications, and many other routine uses.
THERMOSPACER
Enables temperature control of sample compartment
A corrosive-resistant, light-tight, metal plate contains internal coils for circulating constant temperature fluid. Thermospacers mount directly on standard instrument. Can be used singly or in combination to maintain sample compartment constant at any temperature between 0 and 100°C. The standard Model DU cell compartment can be held to less than one degree change for a ten degree change in ambient temperature.
Designed for greatest measurement accuracy with the Model DU . . . and for special measurements such as chemical analyses at constant temperature; the study of reaction rates at various temperatures; precise measurement of extinction values, and other applications where close temperature control is essential.
SHORT PATH FLOW CELL
For extremely short path length measurements on flowing or static samples
Consists of two flat, transparent plates which form an internal cell through which sample can be circulated without exposure to air. Path lengths from 0.05 to 2.5 mm (0.002 to 0.098 in.) available. A special cell compartment containing cell holder and precision positioning carriage attaches directly to Model DU.
Quartz optics permit full-range measurements, 220 to 1000 mmμ . . . All critical surfaces optically polished to ¼ wavelength for precise measurements . . . Extreme flatness of plates allows fluid-tight seal without gaskets or sealing compounds.
Designed for flowing or static measurements on strongly absorbing samples without dilution; on blood samples in vivo under anaerobic conditions (such as determining oxygen capacities of whole blood); for microchemical studies of reaction rates, etc.
50 cm. LIQUID ABSORPTION CELL
For long path length measurements on weakly absorbing samples
To conserve sample volume, the cell is only 25 cm. long, the light beam passing twice through the sample before reaching the phototube.
A special lightproof cell compartment provides a convenient means of standardization without the necessity of using a reference cell. All optical parts are of quartz to utilize full Model DU measurement range. Liquid seals made without gaskets to avoid sample contamination. Careful design eliminates scattered light effects.
Designed for dilute solutions and weakly absorbing samples where a long path length is required. Also for use with flowing samples and for utmost sensitivity in nephelometric measurements to determine, in addition to intensity, the distribution and average size of light-scattering particles.

BORER-INFESTED CORN *is unable to withstand high winds; thus, weather loss is added to lower yield.*

buy SANTOBANE now!

help stop corn borer in 1950 crop!

FREE OF BORERS, *corn yields more bushels per acre and shows greater resistance to wind.*

Corn borers caused a loss of more than 275,000,000 bushels of corn in the corn-belt states alone last year. Losses ran as high as $750 to a farm. With such losses fresh in their memories, 1950 corn growers will expect you to have ample insecticide to combat the corn borer, which may attack twice this year.

That's why it will pay you to place your order now for Santobane, Monsanto's DDT. Have merchandise on hand and profit by getting farmers to stock their next summer's needs *now*.

Properly formulated Santobane has broad insecticidal qualities, acting both as contact poison and stomach poison. It is an effective insecticide base for use in dusting powders, emulsions, suspensions and solutions.

Santobane, available in 100-pound bags, can be shipped immediately. For further information and quotations, mail the coupon or contact the nearest Monsanto Sales Office. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1766-C South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

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ortho-DICHLOROBENZENE (Commercial Grade)
SANTOBANE® (DDT)
SANTOCHLOR® (para-Dichlorobenzene)
SANTOPHEN® 20 (Pentachlorophenol, Tech.)
TRICHLOROBENZENE, Technical
NIFOS®-T (Tetraethyl Pyrophosphate, Tech. For agricultural use only)
NIRAN® (Parathion. For agricultural use only)

MONSANTO HERBICIDAL CHEMICALS

2, 4-D ACID
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2, 4-D ISOPROPYL ESTER
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2, 4, 5-T ISOPROPYL ESTER
SANTOBRITE® (Sodium Pentachlorophenate, Tech.)
SANTOPHEN 20 (Pentachlorophenol, Tech.)
ISOPROPYL N-PHENYL CARBAMATE

®Reg. U. S. Pat. Off.

MAIL COUPON FOR DATA on *Monsanto Emulsifiers and Wetting Agents. Ask for new Technical Bulletin No. P-142.*

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CHEMICALS for PLASTICS

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
1766-C South Second Street, St. Louis 4, Missouri

Please send ____Bulletin P-142; ____information and quotations on Santobane and on the following Monsanto insecticidal and herbicidal chemicals

Name ..... *Title* .....

Company .....

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SERVING INDUSTRY . . . WHICH SERVES MANKIND

Residue Tolerance Hearing Digests

Testimony and data presented by witnesses during the Residue Tolerance Hearing bring together the research in the field of agricultural chemicals of the past several years, including the latest technical information on entomology, pathology, toxicology, residues, residue removal, and related subjects. This Hearing will cost several hundred thousand dollars.

The testimony is summarized and indexed by NAC daily, and mailed twice a week.

These reports are invaluable for every research and legal library, to every producer, fomulator, and large distributor of agricultural chemicals.

The summary contains:

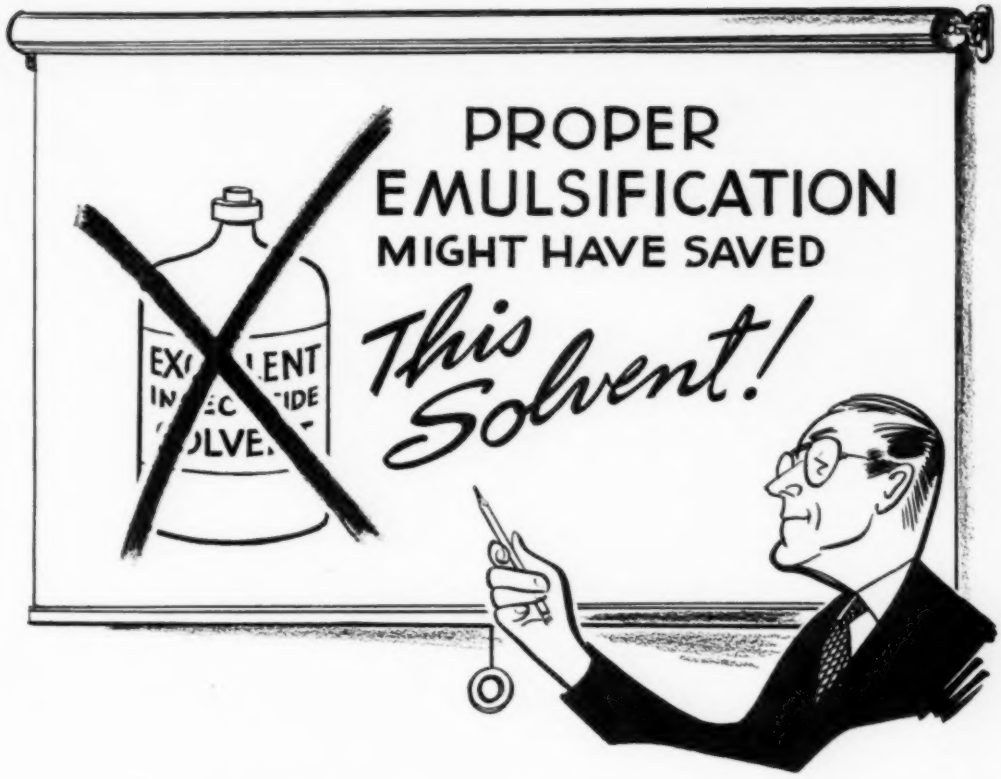
A. List of individuals or companies who have entered official "appearances" at the Hearing.
B. Procedural rulings.
C. Schedules of witnesses, miscellaneous information.
D. Index of witnesses and persons submitting affidavits.
E. List of exhibits (including affidavits).
F. Summary of testimony (including every chemical mentioned and every crop on which chemicals are recommended or used).

NAC Hearing Digests are distributed to Members as a part of the Association's service.

These digests are available, at a nominal cost, to all interested parties. For further information write to:

National Agricultural Chemicals Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.



SPECKLING and burning of foliage is really a tough problem for technologists working to control insect pests with oil solutions of insecticides. To begin with, what causes this trouble? Is it the toxicant? The solvent? Or something else?

Emulsion research reveals that quick-breaking emulsions nearly always cause "burning." When oil separation is controlled by proper emulsification, plant injury is rare. Many a perfectly good solvent is rejected from formulas when all it actually needs is to be combined with the right emulsifier.

You can depend on Atlas to bring you the latest developments in emulsion technology. And you can depend on Atlas technicians for help in solving *your* emulsion problems. As a starter, write today for the latest Atlas pamphlet featuring Atlox 1045-A and Atlas G-1256 emulsifiers in twenty-six different formulas for agricultural, pesticide, and animal-dip applications.

Atlox: Reg. U. S. Pat. Off.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

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ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

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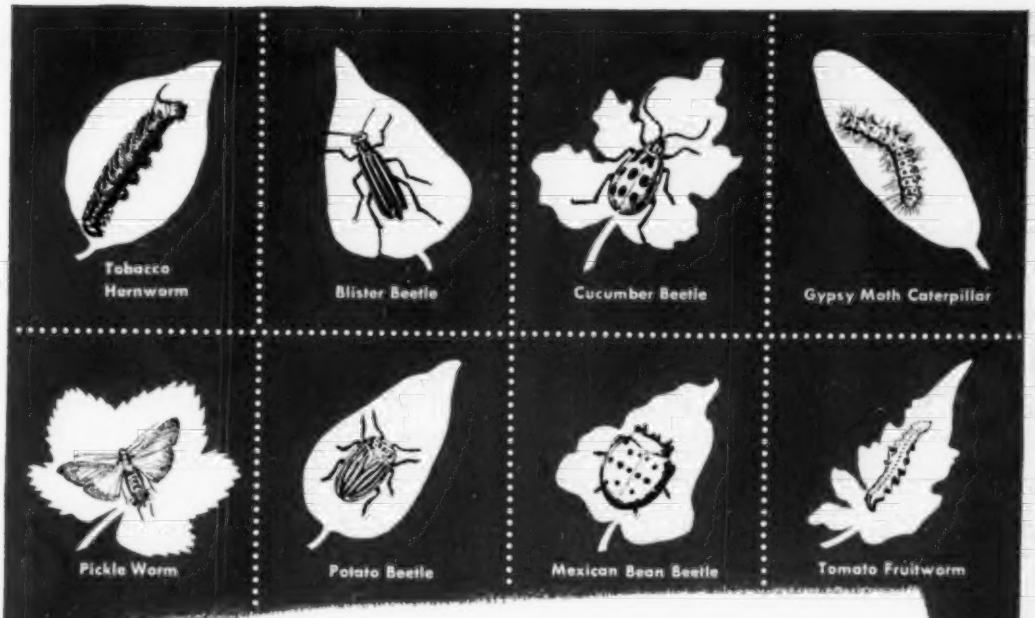


Protect truck crops and tobacco the natural way...

use KRYOCIDE

(Natural Cryolite)

Out of the earth comes cryolite—natural cryolite—which Pennsalt converts into Kryocide®. This product has proved itself through many years of satisfactory use. You're sure of a *safe, dependable,* and extremely *effective* insecticide for the protection of truck crops and tobacco.

It's easy to apply, and it's economical, too! Kryocide is finely ground (micron-sized) for more complete coverage. You can use it as a dust or spray. And, most important of all, you need fewer applications—because Kryocide lasts for a long time.

What's more, Kryocide does not burn foliage. It is not acutely poisonous to warm-blooded animals. And it's entirely compatible with non-alkaline fungicides and insecticides.

When you buy Kryocide, you buy from a reliable company with 100 years' experience in the chemical field. You get guaranteed high quality at low cost—with speedy delivery from nearby warehouses. And our technical representatives are always at your service. Write for further information to: Agricultural Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas; Los Angeles, Calif.; Portland, Oregon.

***KRYOCIDE** is effective against these pests and many others:*

- Tobacco Flea Beetle
- Tobacco Hornworm
- Blister Beetle (Potato Bug)
- Cabbage Worms and Loopers
- Corn Earworm (on beans)
- Cranberry Fruitworm
- Cucumber Beetle
- Diabrotica Beetle
- Gypsy Moth Caterpillar
- Melon Worm
- Mexican Bean Beetle
- Pepper Weevil
- Pickle Worm
- Potato Beetle
- Soybean Caterpillar
- Squash Vine Borer
- Strawberry Leaf Roller
- Strawberry Root Aphid
- Tomato Fruitworm
- Tomato Pinworm
- Vegetable Weevil

PENN SALT

agricultural chemicals

PROGRESSIVE CHEMISTRY FOR A CENTURY

Baughman

MODEL O-2 ATTACHMENT

spreads rock phosphate faster and more economically than any other method

Specially designed to prevent material from packing and crusting — perfect for spreading rock phosphate, dry powdered lime and other fertilizing materials.

Spreads from 100 to 5000 pounds per acre . . . covers 2 acres for every mile traveled at speeds up to 15 mph. Gives uniform spreads on the level, slopes or hillsides. Spreads 16½ feet widths.

The Model 0-2 is 16½' wide . . . folds for highway travel.

"Hi-Speed" Low Cost Transport

For efficient bulk hauling of superphosphate. Positive belt drive conveyor in bottom of body unloads quickly and with minimum agitation. Compartmentized. Waterproof roof can be installed. Standard sizes — no high cost of special construction.

BAUGHMAN also builds bodies for hauling rock, phophate, limestone and other commercial fertilizers. A model for your every need.

Model 235 Holds Spreads to the Ground

For Model K, K-2 and K-3 Bodies . . . prevents wind from scattering spreads. Confines air blast from distributor . . . directs materials outward and groundward. Causes the spread to LAY and STICK. Spreads limestone up to 30 feet . . . phosphate and other fertilizers up to 20 feet. Opens to 18 feet quickly and easily . . . folds for highway travel.

Model Q Portable Conveyor

Loads and unloads from the horizontal to 60°. Capacity up to 40 bu. per minute. Big 9" conveyor screw handles any dry, powdered or granular materials. Available with or without wheels — hundreds of applications.

WRITE . . . for complete details of BAUGHMAN fertilizer handling and spreading equipment.

BAUGHMAN MANUFACTURING COMPANY INC.

141 SHIPMAN ROAD **JERSEYVILLE, ILLINOIS**

Fly Control: 1950 Model

In fighting flies, dairy farmers have now come to realize that the job requires more than just a few daily or weekly squirts of fly spray on cows and buildings.

They know that a sanitation program, coupled with timely sprays of MARLATE methoxychlor insecticide, readily and safely controls stable flies, houseflies, horn flies and mosquitoes.

In using this long-lasting insecticide on animals and buildings, they have approval of the U. S. Department of Agriculture. For MARLATE does not present any danger to the livestock, to the people who spray them, or the people who eat meat and milk products from the treated animals.

MARLATE is equally effective and safe for use on other livestock and on forage crops and on fruits and vegetables used for human food. Residues of MARLATE from normal applications are not hazardous. It's versatile, it's effective, it's safe. It's another product of Du Pont research, developed through eight years of intensive work to provide another of the "Better things for better living . . . through chemistry."

For full details on MARLATE, write to Du Pont, Grasselli Chemicals Department, Wilmington 98, Delaware.

DU PONT CHEMICALS FOR THE FARM INCLUDE:

Fungicides: PARZATE® (Liquid and Dry), FERMATE®, ZERLATE®, Copper-A (Fixed Copper), SULFORON® and SULFORON®-X Wettable Sulfurs . . . Insecticides: DEENATE® DDT, MARLATE® Methoxychlor, LEXONE® Benzene Hexachloride, KRENITE® Dinitro Spray, EPN 300 Insecticide, Calcium Arsenate, Lead Arsenate . . . Weed and Brush Killers: AMMATE®, 2,4-D, TCA and 2,4,5-T . . . Also: Du Pont Cotton Dusts, Du Pont Spreader Sticker, PARMONE® Fruit Drop Inhibitor, and many others. ®REG. U. S. PAT. OFF.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Listen to Du Pont "Cavalcade of America"—Tuesday Nights—NBC Network

Apple production "up" 10 to 15%!

NEW—

16% Parathion Water Miscible

A new Pittsburgh product—a liquid concentrate specifically for the control of greenbugs on grain.

Other
Pittsburgh Agricultural Chemicals

2,4-D Acid **2,4-D Isopropyl Ester**
2,4-D Secondary Butyl Ester
2,4-D Amine Concentrates
2,4-D Ester Concentrates
Dinitro Ortho Cresol (DNOC)
Parathion—Technical
Parathion—Wettable Dust Concentrates
Parathion—Dry Dust Concentrates
2,4,5-T Isopropyl Ester
2,4,5-T Ester Concentrates
10-20 Brush Killer
Alpha Naphthyl Thiourea (ANTU)
Iminol-D **Sodium Arsenite**
Benzene Hexachloride (BHC)

Pittsburgh Parathion helps do this job!

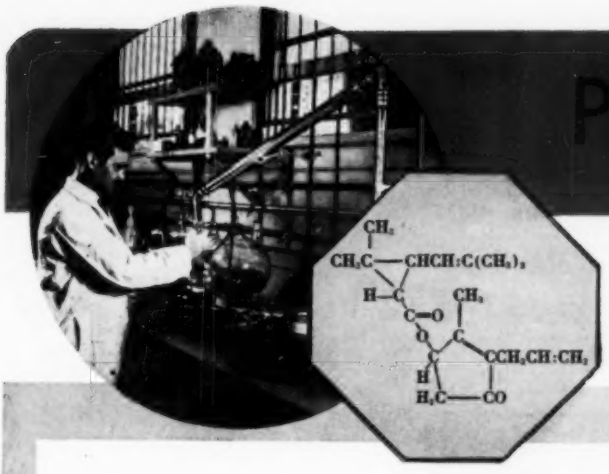
The bumper crop and fine quality of fruit from the great apple belts last year was due in part to the first really widespread use of Parathion, for this most potent insecticidal chemical yet developed not only destroys the European red mite and other arachnids but appears to be an effective control for a wider range of orchard insect pests than many previously used compounds.

Pittsburgh Agricultural Chemical Company is a basic producer of Parathion and offers *Pittsburgh* 15% and 25% Parathion Wettable Powders, chemically and biologically standardized.

Now is the time to assure your season's supply of this orchard-proved control chemical. For technical assistance and recommendations, write today.

PITTSBURGH AGRICULTURAL CHEMICAL CO.
6505-A Empire State Building • 350 Fifth Avenue • New York 1, N. Y
Chicago • San Francisco • Denver • Tampa • St. Louis

Affiliated with
PITTSBURGH COKE & CHEMICAL COMPANY
Grant Building • Pittsburgh 19, Pa.



PYRESYN

(Synthetic "pyrethrin")

—more precisely: allyl homolog of Cinerin I

Pyresyn is now available for prompt delivery in 110 lb. stainless steel drums.

Based on such preliminary work that has been done, it appears within the realm of probability that this new synthetic will find an important place in the manufacture of household, dairy sprays and aerosols replacing natural pyrethrum, at least to a substantial degree, because of its factor of economy.

In some respects it can be rated as better than the natural, in others, as good as, and to be fair, in certain minor instances, a greater quantity must be used to attain comparable control.

Our Products Development Division has assembled technical data so far developed—a copy is available on request.

Furthermore, 25 and 50 gram experimental samples are available at 50¢ and 40¢ per gram respectively.

S. B. PENICK & COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.
Telephone, COrtlandt 7-1970

735 WEST DIVISION STREET, CHICAGO 10, ILL.
Telephone, MOHawk 4451

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MOLTEN SULPHUR

The discharge lines from the wells deliver the sulphur into sumps at collecting stations which are located near the area being "steamed."

The sump is dimensioned to suit operating conditions, as well as the number of wells supplying sulphur. Cast iron has been found the most suitable material for lining the sump, and for the steam coils on the bottom and at the sides which keep the sulphur in a liquid state. When the sump is reasonably full, pumps force the liquid sulphur through insulated pipe lines to the vats. The pumps are especially designed for this service, the moving parts being either submerged in liquid sulphur or steam-jacketed.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

EFFECTIVENESS OF NEW PARATHION INSECTICIDES ESTABLISHED BY INTENSIVE RESEARCH

The high degree of protection afforded by THIOPHOS® Parathion against most insects attacking fruit and vegetable crops has been established by the three-year research program behind the development of this modern insecticide ingredient.

Participating in the program were state and national agricultural experts, and while the success of parathion on many crops has been firmly established, the program continues to uncover the ability of parathion insecticides to protect many others.

It has been definitely established that, when used according to directions, insecticides containing parathion give outstanding protection against most insects and mites attacking such fruits as apples, grapes, peaches, pears, prunes and plums, strawberries and walnuts. And on vegetables, it kills most insects common to beans, cabbage, celery, corn, cucumbers, squash, peas, peppers, tomatoes, potatoes and most root vegetables.

Be sure to consult your local agricultural authorities on your own insect problems.

PEACHES PROTECTED throughout their growth by THIOPHOS Parathion insecticides show lush foliage, no insect damage.

Thiophos Parathion Insecticides made by National Manufacturers

Insecticides made from THIOPHOS Parathion are available in dust and wettable-powder formulations from reputable manufacturers.

Weather, Timing, Method of Application Important Factors In Successful Use of Parathion

To profit fully from the efficiency of parathion as a pest killer, farmers and fruit growers are being urged by Federal and State agricultural experts to observe carefully the manufacturers' instructions for applying parathion to specific crops. Such factors as weather, timing in relation to the development of the crop and insects, and method of application are known to be just as important as the correct dosage in achieving best results. For this reason, users are advised to consult with local agricultural experts or manufacturers' representatives to be sure of getting the most complete pest control and crop protection with this remarkable insecticide.

Use Parathion Safely

Any insecticide toxic to insects is also hazardous to humans if used carelessly and in defiance of certain common-sense precautions.

These precautions are stated explicitly on every container of parathion insecticides. They must be read carefully and observed strictly to avoid accidents.

It is urged that work crews who are given parathion to apply be fully advised also of the necessity of observing these precautions.

Be sure to write for Growers' Manual on Parathion

AMERICAN Cyanamid COMPANY

Agricultural Chemicals Division

32-D ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Please send me Growers' Manual giving latest recommendations for using Parathion.

Name_____

Address_____

_____

Two New Formulations of Proved Products

NEW ESTERON BRUSH KILLER

NEW ESTERON 245

Esteron Brush Killer and Esteron 245—thoroughly tested over miles of terrain and right-of-ways—now offer *increased* effectiveness over a *greater variety* of woody species.

CHECK these new advantages . . . 1. Both formulations contain a new type of low volatility ester. 2. Both new formulations contain higher percentage of active ingredients. 3. These formulations are more effective per unit of active ingredient. 4. These products are available at no increase in price.

New Esteron Brush Killer and Esteron 245 are ready to work for you with better results . . . greater effectiveness. Certain species such as maple, ash and oaks which have resisted many formulations can now be controlled with these new brush killers. Use new, improved Esteron Brush Killer and Esteron 245 for better brush control . . . greater all-around efficiency!

Write to Dow for complete information.

Agricultural Chemical Division

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED AND GRASS KILLERS • INSECTICIDES • FUNGICIDES
SEED PROTECTANT • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

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CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

prevention is worth a pound of "hoppers"!

Apply CHLORDANE early while the young "hoppers" are concentrated in the hatching areas.

Early season application along fence rows, roadsides, and field margins will provide effective control and prevent destructive grasshopper migration into field crops.

Remember too — early season applications of CHLORDANE require a lesser amount of actual insect toxicant per acre.

For additional information and technical data write to:

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Chlordane

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THE EDITOR COMMENTS

THE Food and Drug Administration Insecticide Tolerance Hearing, which has focused the attention of the entire pesticide industry on Washington for the past three months, is probably one of the best things that has happened to the insecticide industry and to users of agricultural chemicals as well.

In spite of some early misgivings on the part of industry that the Hearing might result in unjustified restrictions on the use of pesticides, there has been nothing for the industry to complain about to date in the way the Hearing has been conducted or the general tone of the testimony. Witnesses have done a splendid job of establishing solidly the absolute necessity of using pesticides, and in addition, the need for having a wide selection of all types of materials to fit the specific needs in different climates and for various pests. They have brought out that recent experiences with DDT indicate that insects may build up an immunity to insecticides with which they come in frequent contact, emphasizing the need for more research to develop additional toxicants.

Looking at the Hearing objectively, one observes the gathering of a tremendous assortment of data which would have been practically impossible to obtain in any other way. Thousands of pages of testimony are now on the record . . . testimony from persons whose high standing in the pesticide field is unchallenged . . . representatives of the U. S. Department of Agriculture; extension specialists and growers who possess intimate knowledge of the importance of controlling pests from a dollar-and-cents standpoint; and manufacturers bringing years of practical know-how to the stand to contribute to the tremendous permanent file of testimony which adds up to the greatest collection of data ever assembled in one place in the history of the industry!

Assimilation of this material may take a long time, but we have a feeling that eventually, it will be the means of correcting much of the confusion which has existed in the field for several years. The establishment of tolerances for pesticides old and new will set universally-recognized standards to guide future planning.

It is doubtful that without the Hearing, such a collection of data would ever have been assembled. It was a job too big for the industry itself to have undertaken; both from the standpoint of prohibitive cost and because of a lack of proper coordination. Also, the findings of an investigation conducted entirely by manufacturers could be regarded as biased.

However, it might be well for the industry to remember that the Hearing isn't over yet . . . that there are still many subjects to discuss and many more witnesses to appear; some of whose testimony may be at sharp variance with what has been said so far. We cannot visualize, however, that any testimony to come can materially alter the picture that has already been built up, establishing the absolute essentiality of intelligent use of insecticides and fungicides in guaranteeing the nation's food supply.

A RENEWED emphasis on the importance of pastures to utilize acres taken out of cultivation, is being noted from many quarters. Not only the fertilizer industry is interested in making 1950 a "pasture year," but a number of states have made the proclamation also. Initiated by Governor Elbert N. Carvel of Delaware who proclaimed a pasture year in his state, the idea has spread to other states following Gov. Carvel's plea to the other 47 governors to issue similar proclamations.

Although there is not complete agreement on many phases of how the farmer should readjust his operations following surpluses and acreage

restrictions, it seems to be rather universally agreed that better pastures are desirable to conserve soil and to provide cheap feed for livestock.

Such a program is favorable from the standpoint of the fertilizer industry. High fertility means high feed value for livestock, and the application of fertilizers is a "must" for quality forage. Numerous data from many experiments bear out this contention, as noted in reports from different sections of the country. The improvement of legume hay, for instance, is outstanding. A Michigan test showed a yield of 4,171 pounds of hay per acre on an unfertilized plot, while the addition of 600 pounds of 0-16-16 increased the harvested total to 10,545 pounds! And the use of liberal quantities of commercial fertilizer not only increases the yields of grasses and legumes, but also makes them more nutritious and more palatable to livestock.

Fertilizer manufacturers may do well to note this trend, and to capitalize on the publicity which is urging farmers to improve their pasture lands. Should this idea be sold generally, we can see a considerable increase in fertilizer sales over the years.

THE science of entomology lost a good friend with the recent passing of P. N. Annand, Chief of the U. S. D. A. Bureau of Entomology and Plant Quarantine. Dr. Annand had been with the Department for 21 years, becoming chief of the BEPQ in 1941. His contributions to entomology are too well known and numerous to recite here, but his influence will long be felt in the field of agricultural pest control, not only in the United States but in many parts of the world. It was under Dr. Annand's direction that the B.E.P.Q. won some of the important entomological battles of the recent war, developing the DDT and aerosol programs, and helping to achieve our tremendous food production in the face of insect attacks.

With his colleagues in the far-flung Department of Agriculture from coast to coast, we feel deep regret at his passing and express the hope that his successor will continue the advancements in entomological work which have been carried out under Dr. Annand's administration.

THAT large-scale production of "synthetic pyrethrum" should become a reality a year after the original announcement was made of its synthesis in a U. S. D. A. laboratory, is a tribute to the "know-how" of the chemists and entomologists who worked together on this difficult problem. Now designated as "allethrin," the allyl homolog of Cinerin I requires a dozen distinct steps in its manufacture, the process being extremely complex, with a million pounds of chemical solids and liquids, including water, being required to produce 5,000 pounds of finished material.

The industry is watching very closely the development of this newcomer in the pesticide field, and reactions to its arrival are mixed with both fear and elation, depending upon the point of view. To those who have long desired a domestic source of pyrethrins without having to depend upon importations from half around the world, the news is heartening. To many others, it poses a good many questions not easy to forget. Will demand for the new material bring about increased production with a consequent reduction in unit price? Will its presence on the market help solve the supply situation which now haunts the trade? How effective will it be when further tests are made? What about its toxic residue properties as compared to natural pyrethrum? So far, the tests have looked good from many angles. Toxicity is thought to be no greater than that of the natural product. Its effectiveness on a relatively small group of agricultural pests appears to be satisfactory, but the final word on this score will not be available very soon, of course.

In the meantime, the trade will continue to watch the development of this test tube baby to see whether or not answers to the many questions concerning its future are favorable. Our first reaction is that allethrin may solve more problems than it will cause.

Petroleum Weed Killers

by

John M. Bell[1] **and**

W. Luther Norem[2]

PART I

THE weed killing properties of petroleum oils[3] have been known and used for many years, but recent developments in petroleum technology have produced materials with such improved qualities that these oils may now be considered among the new herbicidal chemicals. They rank with 2,4-D, isopropyl phenyl carbamate and the dinitro compounds. Petroleum products such as Diesel fuel, crude oil and smudgepot oil which are cheap and handy have been used extensively to destroy weeds on roadsides, ditch banks, railroad rights-of-way, and in citrus groves. The first oils to be marketed specifically for weed killing were by-products from the manufacture of insecticidal spray oils, lubricating oils, and kerosene. The material extracted from the raw distillate to improve the performance of the kerosene was found to be quite toxic to plants.

In all of these weed killing oils, the phytotoxicity was due entirely to natural components of the crude oils. The sulfur dioxide extraction concentrated but did not change their character. The technology used now in the improvement of gasoline quality, as well as the manufacture of such chemicals as toluene and xylene from petroleum, transforms the naturally occurring compounds into even more phytotoxic materials. It has been found that synthetic materials similar to those found in modern gasolines but with higher molecular weights are particularly toxic to plants. The highly toxic commercial weed killers now on the market are produced by means of these modern methods.

Weed killers may be classified as either contact or translocated, depending on whether the materials kill only those parts of the plant with which they come in contact externally or are carried into the roots and remote parts of the plant. Petroleum oils are contact herbicides. Although they may creep down the stem surfaces and between the leaf sheaths of grasses, there is no evidence that they are translocated in lethal quantities.

Weed killers may also be classified as general or selective. Some materials will destroy the herbaceous parts of almost every plant species. Other materials are toxic to certain species only. Oils such as Diesel fuel, crude oil, and especially the newer petroleum herbicides sometimes called "high-aromatic" weed killers, are toxic to most species. Other oils, generally boiling at lower temperatures, do not affect certain species, particularly members of the carrot family. Since oils are not translocated, persistent perennial weeds will regenerate from the roots.

One of the questions most frequently asked about petroleum weed killers is, "What one physical property is the best indicator of toxicity?" A fully satisfactory answer has not yet been found because petroleum oils are extremely complex materials which are not adequately defined by any simple physical test or group of tests. Before attempting to relate the physical properties to toxicity, a discussion of the chemical constitution of oils will be helpful.

[1] California Research Corporation San Francisco, California.

[2] California Research Corporation La Habra, California.

[3] Petroleum Weed Killers furnished by California Spray-Chemical Corp., Richmond, Calif.

Chemical Composition

PETROLEUM consists mainly of hydrocarbons, so-called because they contain only hydrogen and carbon. In this respect they differ from vegetable, fish and animal oils and fats, which also contain oxygen. The three main series of hydrocarbons are the paraffins, the naphthenes, and the aromatics.

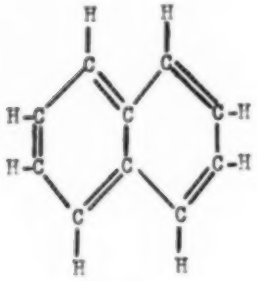
The *paraffins* are compounds in which carbon atoms are linked together to form straight or branched chains. Molecules of this series contain the maximum number of hydrogen atoms and are said to be "saturated." The lowest members of the series with one to four carbon atoms (methane, ethane, propane and butane) are gases at normal temperatures; those with between five and fifteen carbon atoms are liquids; and the longer chains are waxy solids.

The paraffins are all lighter than water. Their specific gravities and boiling points increase with molecular weight. Their saturated character renders them chemically quite stable. They are not attacked under normal conditions by oxidizing agents or strong alkalies. The paraffins are poor weed killers, and their low toxicity can probably be attributed to this chemical inactivity.

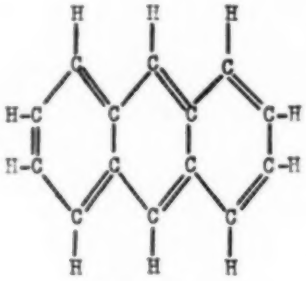
The *naphthenes*, sometimes called cycloparaffins because of their ring structure, are also saturated compounds. They may be considered as rings formed by removing the two terminal hydrogen atoms from a paraffinic chain and bending the chain to join the end carbon atoms. Naphthenes therefore contain less hydrogen than paraffins with the same number of carbon atoms and possess higher specific gravities. In general the naphthenes closely resemble the paraffins

physically and chemically; but they are slightly more toxic to plants.

The *aromatics* are unsaturated (deficient in hydrogen) six-membered ring compounds characterized by alternate single and double valence bonds connecting the carbon atoms in the ring. With a higher carbon: hydrogen ratio, aromatics are more dense than the corresponding paraffins or naphthenes; high molecular weight aromatics being heavier than water. These may be polynuclear, as naphthalene and anthracene:



Naphthalene
(a solid)



Anthracene
(a solid)

Although the benzene nucleus found in aromatics is quite stable, these compounds react readily with sulfuric acid, and the aromatics can thus be separated readily from the hydrocarbons of the other series mentioned. The aromatics have been found to be among the most toxic constituents of petroleum weed killers. (Olefins ((open chan unsaturates similar to the paraffins)) make up a series which seldom occurs naturally in crude oil. They may be produced in small amounts by incidental cracking in the refinery. As they are of little interest as herbicides, they will not be considered in this discussion.)

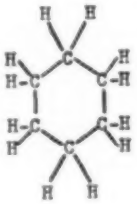
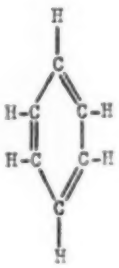
Table I compares representative six-carbon atom compounds of the three important hydrocarbon series.

The great bulk of petroleum consists of mixed molecules which contain both straight or branched chains and either aromatic or naphthene rings. These compounds may be regarded as having been derived from a ring compound by substituting one or more paraffinic chains for one or more hydrogen atoms on the ring. Thus, toluene may be considered to be a combination of benzene and methane, and may be called methyl benzene as seen on page 33.

The toxicity of compounds is increased as one or more side chains are added to the aromatic nucleus as shown above. This toxicity increase reaches a maximum value at the point where the paraffinic portion (side chain) of the molecule is about equal in molecular weight to that of the aromatic nucleus. As the side chains increase in length beyond this point, the molecule becomes more paraffinic in nature and less toxic, the long side chains acting as diluents. Certain refining processes may break off these long side chains, while other treatments transform them into aromatic nuclei giving rise to polynuclear molecules. In either case, the treatment enhances the phytotoxic properties.

The number of possible hydrocarbon isomers (compounds with the same number of carbon and hydrogen atoms but different molecular structure) is enormous. Thus 802 compounds are possible with the same empirical formula $C_{11}H_{26}$. However, relatively few of the possible compounds are found in crude oil and these tend to fall into a comparatively small number of homologous groups. (Homologs are compounds with the same type of molecular structure, each member differing from the preceding member by a —CH_2 group). Even so, the compounds in a given crude oil number in the thousands. There is a wide variation in the composition of oils from various

TABLE I

Class	Paraffin	Naphthene	Aromatic
Name	Normal hexane	Cyclohexane	Benzene
Structural Formula			
Chemical Formula	C_6H_{14}	C_6H_{12}	C_6H_6
Type Formula for the Series	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-6}
% Carbon by weight	83.7	85.7	92.2
Specific Gravity at 68°F.	0.659	0.779	0.879

oil fields, from various parts of the same oil field and even from the same well.

Great Complexity

BECAUSE the composition of petroleum is so complex, the separation and identification of the various components is laborious and often impossible. The high molecular weight compounds whose physical properties differ very little are particularly hard to separate. Furthermore, the products of petroleum in common use (fuels, lubricants and asphalts) have been defined, up until the last decade or two, almost entirely by a few arbitrary physical tests. These include: distillation range, viscosity, flash point, and (for asphalts) penetration and melting point.

Recent improvements and expanding uses of petroleum products have imposed stricter specifications. Performance in many uses has been related to chemical composition. Exact definition of the chemical composition is still not always necessary, but tests have been developed which are indicative of the general types of compounds present.

The addition of weed killing to the list of primary rather than the incidental uses of petroleum oils has been so recent that a completely satisfactory set of specifications has not yet been developed. Attempts to define toxicity by the physical tests used by the oil industry have been only partially successful. A consideration of several properties enables one, however, to predict the performance of a weed killer to a certain extent. These properties, their measurement and interpretation will be discussed below.

TABLE II

PROPERTIES OF TYPICAL WEED KILLING OILS

	Selective Weed Killer	Non-Toxic Tree Spray Oil	Diesel Fuel	General Contact Weed Killer
Gravity, API	42	30.5	32	24
Gravity, Specific	0.817	0.874	0.865	0.912
Viscosity, SSU at 100°F.	—	58	38	37
Aniline Point, °F.	116	177	139	87
Aromatic Content, %	17	—	19	—
Unsulfonated Residue, %	—	90	—	10
Distillation Range, °F.				
Initial	310	515	370	415
10%	330	560	460	460
50%	340	600	530	510
90%	370	675	610	660
End Point	405	700	670	720
Relative Toxicity, %	Selective	0	20	90

Physical and Chemical Tests*

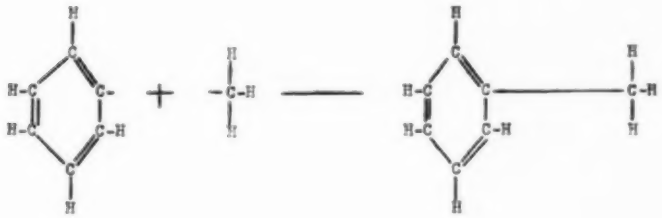
VISCOSITY (ASTM Method D 88-44). This property measures the fluidity of an oil and the ease with which it can be pumped or sprayed. It is reported as the number of seconds required for 60 cc. of the oil to flow through an orifice of standard size at some fixed temperature, usually 100°F. Viscosities in the 35-50 second range are satisfactory for contact herbicidal oils. Oils of higher viscosity are difficult to pump and atomize. When sprayed upon plant material, they may not creep and flow and cover the plant with a uniformly thin film of oil. Instead they strike the plant as tiny droplets, causing a "buckshot" pattern of injury from which the plant recovers.

Aromatic Content—Since the aromatic hydrocarbons are those of greatest herbicidal activity, information regarding their concentration in a weed killing oil is valuable to the user. Usually the aromatics make up from 40 to nearly 100 per cent of the general herbicides and 10 to 20 per cent of the selective herbicides.

Several methods have been devised for determining or indicating the aromatic content of the oils. For those materials whose boiling range does not exceed 600°F., a method (ASTM method D875-46T) similar to the Babcock test for determining butterfat content in milk is most satisfactory. For measuring the aromatic content of higher boiling oils, the unsulfonated-residue test (ASTM D483-40) is more satisfactory.

The aniline point (ASTM method D611-47T) is an index of the solvent power and of the percentage of aromatic hydrocarbons present in the oil. The test is performed by determining the temperature at which a cloud develops when

* Methods for determining these properties are defined by the American Society for Testing Materials. The standard test procedures are described in the handbook "ASTM Standards on Petroleum Products and Lubricants."



Phenyl radical + Methyl radical → toluene
(derived from benzene)

a solution of equal volumes of aniline and the oil is cooled. In the selective weedkiller range, hydrocarbons have the following aniline points:

Paraffins	160	—180°F.
Olefins	100	—135°F.
Naphthenes	120	—140°F.
Aromatics	Below	—25°F.

The aniline point of aromatics is below the freezing point of aniline. An oil with a high aromatic content must therefore be diluted with n-heptane or other paraffinic diluent before the test can be run.

These tests indicate the volume per cent of aromatics present, but do not show the size of the molecules or the number and size of paraffinic and naphthenic side-chains. They cannot be used alone, therefore, as indicators of toxicity.

Distillation Range—The boiling or distillation temperature of a compound is a measure of molecular weight and therefore another property that can be used to characterize oils. Low boiling hydrocarbons evaporate so quickly when sprayed on plants that they do not remain in contact with the tissues long enough to penetrate and cause severe injury. High boiling materials on the other hand are viscous liquids or solids with such large molecules that even though dissolved in lighter materials, they cannot penetrate the tissues. Between these extremes, the toxicity increases with the boiling temperatures. The lower boiling oils act quickly and their maximum effect may be observed in a few hours (acute toxicity), while the higher boiling materials may continue to act for several days (chronic toxicity).

The range of volatility of petroleum oils is so broad that separate testing methods have been developed for the products within various ranges. The ASTM methods applicable for the distillation of weed killers are D86-46 for the selective herbicides and D158-41 for the general type. Petroleum products break down or "crack" at temperatures above 700°F. and distillations are discontinued at that point.

Sweet, Kunkel and Raleigh (7) report that petroleum products boiling between 300° and 550°F. may be used as selective sprays for carrots, but that a range of 300° to 400°F. is more satisfactory because objectionable flavors are less persistent.

General weed killers usually have a distillation range between 350° and 700°F. A minimum of 425° for the 10% and 625° for the 90% distillation points may be considered most satisfactory. An excess of high boiling materials increases the viscosity beyond desirable limits.

Gravity (ASTM Method D287-39)—The density of an oil is customarily expresed by the petroleum industry in terms of its API gravity rather than by its specific gravity. The American Petroleum Institute relates these quantities by the formula:

$$\text{API Gravity} = \frac{141.5}{\text{Specific Gravity } 60°/60°} - 131.5$$

In this system water has a gravity of 10°API, gravities of liquids heavier than water are represented by numbers smaller than 10, typical lubricating oils have gravities of 20° to 30°, kerosene about 45°, and gasoline about 60° to 65°. Special hydrometers are used to measure API gravities.

API gravity is related to the type and molecular weight of the chemical compounds in the oil. In oil products with a similar distillation range, those with the lower API gravity (higher specific gravity) normally contain the higher percentage of aromatics. However, in products having the same aromatic content, the lower API gravity indicates higher molecular weights.

Gravity cannot be used alone to predict toxicity unless some other property such as boiling range is fixed. In general, contact weed killers are low gravity products (32° API maximum), while selective weed killers are volatile products whose gravities are in the region of 42° API.

Flash Point (ASTM Method D93-46)—This property does not affect the performance of a weed killer directly. However, it does concern the safety with which the product can be handled. In making the flash point test, a small flame is periodically applied above the oil surface while the oil is being heated in a cup. The flash point is the temperature at which the first non-sustaining flame passes over the surface. Most contact weed killers have flash points above 180°F. Being less flammable than Diesel fuel, they can be applied with little danger of fire, the greatest fire hazard being presented by the dead weeds they produce.

Selective weed killers are more volatile. Their flash points (ASTM method D92-46) are usually above 100°F. They should be handled with the same precautions observed with kerosene and paint thinners. The general relationship between these chemical and physical properties and phytotoxicity can be illustrated as seen in Table II.

The first attempts to correlate the phytotoxicity of petroleum oils with physical properties were made

(Turn to Page 99)

TABLE III

PROPERTIES OF DIESEL FUELS

	1935	1949
Gravity, °API	29.5	32.1
Viscosity, SSU at 100°F.	40	37.7
Sulfur, %	0.60	0.57
ASTM Distillation, °F.		
10%	480	460
50%	545	530
90%	650	610
End Point	730	670

Tolerance Hearings, Liability, and Education features at Meeting of

National Agricultural Chemicals Ass'n.

WITH the Food and Drug Administration tolerance hearings recessed for the event, the annual Spring Business meeting of the National Agricultural Chemicals Association was to be held at the Haddon Hall Hotel, Atlantic City, N. J., April 20 and 21. The announced recess of the Hearings in Washington was expected to permit a greater attendance among industry people and members of the Association.

The program itself was to feature panel discussions on problems pertaining to the agricultural chemical field, with but few formal addresses. Planning for the entire program was built around current needs, including an intensive examination of problems such as the present hearings, product liability, legislation, safety and information.

The following have agreed to serve as Panel Moderators at the two-day conference:

Thursday, April 20

Product Liability Forum—Wilton M. Taylor, Niagara Chemical Division of Food Machinery & Chemical Corp.

Legislative Forum—W. W. Sunderland, The Dow Chemical Co., Midland, Mich.

Friday, April 21

Food & Drug Hearing Forum—Howard Grady, California Spray-Chemical Co.

Information Forum—Wallace S. Moreland, Rutgers University, New Brunswick, N. J.

Ernest Hart, Niagara Chemical Division of Food Machinery & Chemical Corp., Middleport, N. Y., president of the NACA, will give his presidential address and Lea S. Hitchner, NACA executive vice-president, Washington, is to present his report of Association activities during the past half year.

Appearing on the panels, according to earlier announcements by the NACA, were to be leaders in the industry, and members of the Association staff. On the residue tolerance panel was to appear John D. Conner, NACA special counsel, Washington; C. C. Alexander, Geigy Co., Inc., New York; and F. J. Rarig, Rohm & Haas Co., Inc., Philadelphia.

The forum on liability was to include George Lamb, Washington attorney; and Richard Hansen, General Chemical Division, Allied Chemical & Dye Corp., New York.

Appearing on the legislative panel were to be Joseph A. Noone, NACA, Washington; and Dr. Charles L. Smith, Ethyl Corp., New York; while the public relations panel was to include M. R. Budd, Hercules Powder Co., Wilmington, Del.; Harold C. Cunningham, Rohm & Haas Co., Philadelphia; Eugene E. Perrin, Dow Chemical Co., Midland, Mich.; and Donald G. Lerch, Jr., NACA.

HOWARD GRADY
Leads Panel on Hearings

ERNEST HART
Gives Presidential Address

LEA S. HITCHNER
Reports Association Work

Minor Elements in

FERTILIZERS

EVER since the discovery that some soils show a deficiency of some of the minor elements, the question has been raised by many fertilizer manufacturers whether or not some of these missing or deficient elements should be added to their mixtures. The answer by this author has been in the negative, unless the manufacturer is mixing fertilizer for a specific area or crop, and knows exactly how much fertilizer is going to be applied per acre per crop.

In discussing minor elements, however, the writer does not include magnesium since it is considered as belonging to the major group. But the other elements generally regarded as "minor" should not be included in fertilizer mixtures for a number of reasons. These reasons, four in number, are:

1. Many soils and crops do not need the minor elements.
2. There is danger of using too much.
3. Better results are obtained through spray applications than through application with regular fertilizer materials.
4. The addition of minor elements to mixed fertilizer adds to the cost of the product.

While it is true that the areas are increasing where soils need minor elements in order to produce normal crops, yet the majority of the soils are not in need of these elements and others need only one or two elements. For example, in the area in central Florida which is devoted to growing vegetables, there is yet to be demonstrated that any of the minor elements except boron are insufficient in supply. Although researchers have seen response in pot experiments from applications of a combination of cobalt, manganese and zinc, repeated applications of various groups of minor elements, including the above, on field plots have never demonstrated any benefits from their use. The explanation seems to lie in the fertilizer practices followed. In this section of Florida it is customary to apply three or four tons of fertilizer per acre a year and in addition a considerable number of growers broadcast a ton of castor pomace per acre before setting a crop of celery. The fertilizer used, a 5-5-8, has from 35 to 50 percent of its nitrogen from natural organic sources, so it would appear that during a year's time, enough of the minor elements would be contained in the fertilizer used. In addition to the above, most of the growers like to apply muck at the rate of 100 tons per acre every few years. The only minor element needed on the majority of the soils is boron, and this is generally applied at the rate of 10 pounds of borax per acre mixed with a spray application.

Too Much Is Toxic

THE second reason for not wanting the minor elements in the fertilizer is because some elements, such as boron and zinc, are decidedly toxic if used to excess. In sections of the country where the fertilizer application per crop amounts to only 500 or 1000 pounds per acre, this would not constitute so much of a problem, but when, as has been indicated, a grower uses three tons of fertilizer per acre per crop, danger from overdosing is greatly increased. Boron, especially, is decidedly toxic under certain conditions. Toxic results have been observed from applications as low as 15 pounds of borax per acre on celery. It is not at all unusual to see celery plants showing boron injury at the end of the row where the spray rig turned around and the operator neglected to turn off the sprayer while making the turn. Since the recommended application of boron is but 10 pounds per acre of borax it can be seen readily that a fertilizer manufacturer selling a product to which boron had been added could easily get into trouble if the grower used more of the fertilizer per acre than the manufacturers had anticipated or less than he had expected. If too much is used, the grower might get boron toxicity. If he used less than the correct amount, he probably would not get enough to prevent the development of cracked stem in his crop. In either case the fertilizer would get the blame.

Zinc is another of the minor elements that should be used with caution. Usually 20 pounds of zinc sulfate per acre is sufficient to overcome the deficiency. Just how much more the plants will stand, is not certain. In the Bradenton area of Florida, zinc toxicity has been observed where the grower has used "*Dithane*" plus zinc sulfate every four or five days on tomatoes. Similar toxicity was observed on tomatoes when this spray was used at weekly intervals and a minor element nutrient spray containing zinc was used on tomatoes. A similar report comes from the lower East Coast tomato growing section. When fungicides are applied once or twice a week at the rate of 100 gallons per acre the spray does not have to contain a great deal of zinc before toxic quantities are applied. If, in addition to this, some zinc is in the fertilizer that is being used, it is likely that more trouble will develop.

by

R. W. Ruprecht

Vice-Director in Charge
Central Florida Experiment Station

Previous articles have appeared in Agricultural Chemicals on the desirability of including minor elements in fertilizer mixtures. But as in all cases, there are other points of view to consider, and here Dr. Ruprecht ably presents the other side of the question.

—EDITOR

One of the chief reasons advanced for adding the minor elements to fertilizer is that a grower is less likely to use an overdose of these elements. When put on as separate applications the tendency is to put on too much, on the old theory: "If a little is good, more is better." Such experiences were noted when borax was first recommended to overcome "Cracked Stem." Several growers learned to their sorrow that more than the recommended amount can be too much.

In recent years, however, not a single case has been noted where a grower used too much borax. They seem to have been taught not to use more than is recommended by the manufacturer of the minor element mixtures which appear on the market, and which a few growers use from time to time. While such growers claim benefits from the use of such applications, they have no way of checking on this because as a rule, they apply the spray to their entire acreage without leaving a check plot. One large grower had been in the habit of using such a nutritional spray until he was persuaded to leave a portion of his field unsprayed. This revealed that he was getting just as good crops without the spray. He did not use the spray again.

Spraying More Efficient

THE third reason for not mixing the minor elements in the fertilizer is that with most of the minor elements, quicker results may be obtained with much smaller amounts if they are applied as a spray. Also, in some soils many of the minor elements are changed to an unavailable form when applied as fertilizer. Zinc, for instance, gives no results when applied as zinc sulfate to the light sandy soils in the Ridge section of Florida, while spray applications of 3 pounds of zinc sulfate per 100 gallons of water will give adequate amounts of zinc for citrus trees. In the case of copper, while 3 pounds of copper sulfate as Bordeaux per 100 gallons will give adequate amounts of copper, it requires 1 percent of copper in the fertilizer to give the same results. Likewise, on calcareous soils it is useless to apply zinc, iron or copper as soil applications since these elements are rendered unavailable; but spray applications give almost immediate response. Iron is another element that seldom gives desired results when applied directly to the soil and then only if large amounts are used. Applied as a spray, however, excellent results have been had by using one pound of ferrous sulfate in 1000 pounds of water.

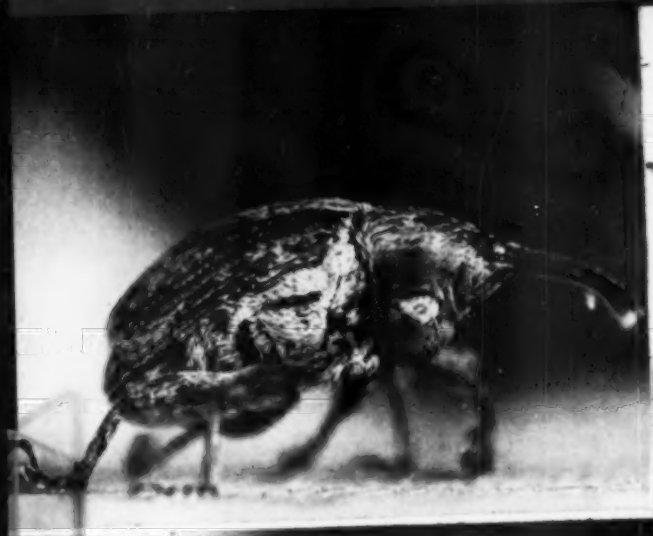
Costs Increased

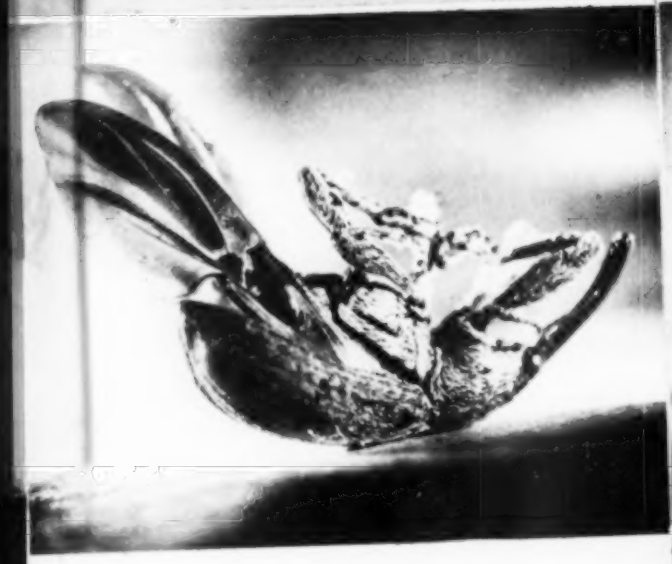
THE fourth reason for not adding minor elements to mixed fertilizer is the increased costs of such fertilizer mixtures. While the amount and cost of the minor elements themselves is small, the labor involved in adding them to the fertilizer mixture increases the cost considerably more than the cost of the material. Thus, the consumer would pay a higher price for a fertilizer mixture that has questionably more value than the unfortified mixtures. The claim has been made that the present deficiencies of these minor elements is the result of using concentrated fertilizers made from highly refined materials with a minimum of natural organics, and that to prevent further deficiencies from showing up in soils now producing normal plants, we should use a fertilizer to which these elements have been added. While there may be some truth in the first part of this statement, there are doubts that the second part is the answer. The manufacturer cannot be sure that he is adding the correct elements or the correct amounts, nor can he be sure that the fertilizer will not be used on soils that would fix the elements in an unavailable form. It should be borne in mind that in some of the soils lacking in minor elements, the deficiencies are caused by their unavailability rather than by their *absence*. For example, in certain sections of Florida, if corn is raised year after year a zinc deficiency shows up. Let this land be idle, producing a crop of weeds and grasses for a two year period, and a crop of corn showing no zinc deficiency can then be grown. Likewise, in other sections, where boron is apparently lacking, a crop of celery may be grown, if it is done slowly enough. It is only when liberal amounts of fertilizer and water have been applied to cause rapid, vigorous growth, that cracked stem develops. In many cases some of these deficiencies can be overcome or prevented through the use of green manure crops at some time during the year. The writer's contention is that if certain elements are known to be deficient, they should be added by themselves; as a spray either mixed with a fungicide or insecticide; as a separate application; (whichever is the most practicable), or in the solid form if spraying is not advisable. It will be cheaper and the grower will know what he is getting and that he is using only the elements that are needed.

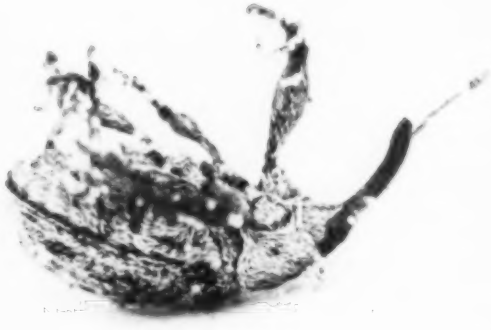
What is said here does not apply to definite areas such as the Everglades where successful culture is impossible without the addition of certain minor elements and where the dosage is fairly well established. But there seems to be no reason or need for the indiscriminate addition of minor elements to fertilizer mixtures in general.★★

Paper presented before Fertilizer Section of A. C. S. Atlantic City, N. J., September, 1949.

DEATH OF A







BOLL WEEVIL . . .

Murder in the cotton field as revealed by Vishniac and his macroscopic camera . . .

JUST what happens to a boll weevil when he gets a dose of insecticide? Or, Murder in the Cotton Field by Hercules Powder Company, manufacturers of toxaphene, aided and abetted by one Dr. Roman Vishniac, noted entomologist - photographer and his trusted macroscopic camera. Please note the "macroscopic," not microscopic.

This series of shots of a boll weevil's actions after tangling with toxaphene was made by Dr. Vishniac for Hercules to show step-by-step the breakdown of the bug's physical powers, and his inevitable demise. Mr. Evil B. Weevil's thoughts during the process may be best imagined by his varying facial expressions and body gymnastics. In the photographic process, the weevil is magnified twenty times actual size.

These pictures, says Dr. Vishniac, are not intended to be a scientific study, but are offered more to show what actually goes on millions upon millions of times when a potent insecticide is applied to stop boll weevil damage in cotton. That this grotesque creature costs American cotton growers many millions of dollars annually which effective control can save, is mute evidence to the economic value of modern insecticides.

Left Hand Page:

Top row (L to R): In this corner, we have Mr. Evil B. Weevil. Having sniffed the fragrance of cotton plants nearby, he's making his way swiftly for a feast. "Right nice of that farmer to provide acres and acres of food for us," he says to himself.

"Hey! What's this? Something new has been added to those plants . . . toxaphene!" Those are knock-out drops, Mr. Weevil, as you'll see. Sort of like vodka with a permanent kick.

(Middle row): "Whew! Shav. thish sthuff ish really tough. Feel like I'd like to shleep!"

The world goes round and round, but the weevil shouldn't care too much since he isn't going to be on board much longer.

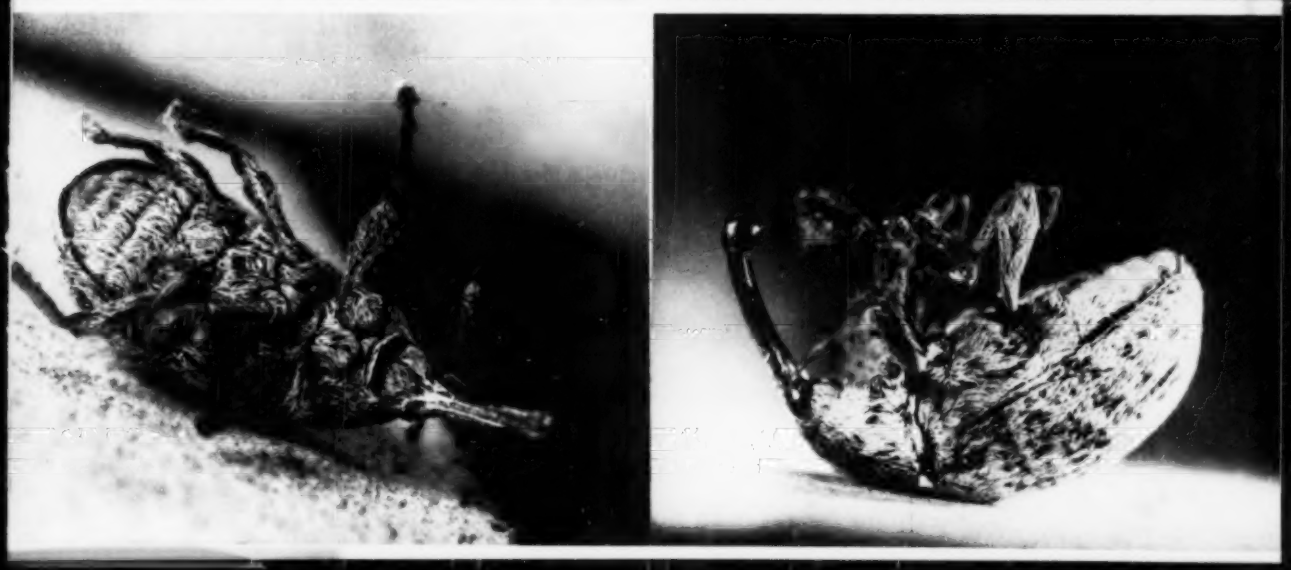
(Bottom row): "Oops! Blackout again. Knockout drops . . . shouldn't have trusted that farmer . . . "

"Something's wrong with my differential . . . legs won't work . . . can't walk . . . feel shaky . . . snout's dragging . . . what a cocktail *that* was!"

Below:

It won't be long now . . . the paralysis is about complete. This toxicant works swiftly and surely. A few more twitches, and . . .

He's out! For good! And he and his billions of brethren will not be around to enjoy the record cotton crop which may result from his demise.



Supply situation tight on many

AGRICULTURAL PESTICIDES

A LOOK at the pesticide situation at press time showed the supply of the synthetic organic insecticidal chemicals to be short of the anticipated demand. The present need, added to prospects of increased demand due to likely outbreaks of corn borers, cotton insects and grasshoppers, coupled with a shortage of necessary raw materials aggravated by the coal strike, has resulted in higher prices for most of these chemicals.

Despite production of benzene hexachloride at a greater rate than has ever been known before, the supply is not sufficient. Spot material is almost non-existent. DDT, after suffering numerous price declines during the past two years, is once again being quoted at 32c in carload quantities.

Toxaphene and chlordane, although presently moving in fair quantity, may prove to be in short supply if the various insect pests really appear as they are expected. 2,4-D and its related compounds have been affected by an upsurge in demand and even though movement has been sluggish, one of the more important producers has announced an increase in price.

The botanicals, arsenicals and most of the fungicides are in sufficient supply so as to constitute no serious problem. Pyrethrum, however, is short and it is not expected that the supply of allethrin, the synthetic allyl homolog of Cinerin I will be of significant assistance for this season in alleviating the shortage.

From a supply point of view, the season will undoubtedly prove a major headache to distributors who normally wait to stock until the infestations are practically upon them. The lesson that should have been learned in the 1948-1949 season may return again to plague them in the 1949-1950 season.

The first part of a summary of insecticides that are to be offered for the first time during the coming growing season was presented in the February issue of AGRICULTURAL CHEMICALS. The second, and final, article on this subject appears here.

"Metacide"

"METACIDE" which had previously been available under the name "Gearphos" will be marketed by a joint company formed by Pittsburgh Coke & Chemical Co. and Geary Chemical Corp. This compound was developed by Dr. Gerhard Schrader, who discovered parathion. The product "Metacide" will be a formulation, the active phosphate ingredient of which is a mixture of the dimethyl analog of parathion and 33⅓% of parathion.

Preliminary work shows that the dimethyl ester is significantly less toxic than parathion and an inhibitor reduces absorption significantly. This material has been offered in Europe for the past two years. It has shown much promise as a control for aphids and most lepidoptera, equal on mites and lower on the larvae of some beetles such as the Mexican bean beetle.

At the recent AAEE meetings in Tampa, Department of Agriculture workers reported on the use of aerosols containing methyl chloride as a propellent and using acetone as a solvent where a half gram of toxicant was used per 1000 cu. ft. of greenhouse space. Non-resistant red spider mites originating from roses were used in the experiments.

Parathion—100% kill
Methyl analog of parathion—39% kill
E-605*—100% kill

The above data would indicate that there is a synergistic action of some kind when parathion is used in combination with the methyl analog.

"Aramite"

"ARAMITE," the active ingredient of which is beta-chloroethyl-beta (p-tertiary butyl phenoxy)-alpha-methyl ethyl sulfite, is a product of the Naugatuck Chemicals Division of the U. S. Rubber Co. It will be available as a 15% wettable powder under the name of "Aramite 15-W."

The material was tested extensively during 1949 and the manufacturer states that it is effective against the active stages of mites with a prolonged residual effect in many cases. The following mites have been controlled: brown, citrus bud, European red, two spotted, poultry, red spider, Pacific spruce and clover.

The manufacturer recommends one lb. of "Aramite 15-W" per 100 gals. of water. If longer residual effectiveness is desired, the dosage can be increased to as much as 2 lbs. per 100 gallons. It is also planned that an emulsifiable concencentrate will be available for experimental use during the coming season since it is believed that the residual effect will be enhanced under wetting conditions where the wettable powder has shown to be slightly less effective. The material is compatible with oils, all of the organic chlorinated hydrocarbons in wettable powder form, and with many of the dithiocarbmate fungicides.

* E-605 is toxic ingredient of "Metacide" composed of 80% Methyl Analog and 20% Parathion.

by

Melvin Goldberg

Pesticide Advisory Service, Inc.
New York, N. Y.

Preliminary results with red spider mites that attack cotton have shown that 4% of "Aramite" applied at the rate of 10 lbs. per acre has shown considerable promise against red spider mites. However, the material will continue to be tested under field conditions during the coming season.

Nitroparaffins

THE nitroparaffins were introduced originally by Commercial Solvents Corp. as the experimental materials under the numbers CS-645A and CS-674A. These materials have been tested in more than 50 experimental stations throughout the country during the summer of 1949 and have given promising results on insect pests on peach and certain other fruits. Perhaps the most outstanding feature has been the control of the Mexican bean beetle and most of the common bean insects. It has also shown considerable promise against potato pests including the leafhopper and the cabbage worm as well as against the Southern army worm and the range grasshopper.

The two materials are being combined and will be offered under the name of "Dilan." Preliminary tests on toxicity indicate these nitroparaffin insecticides are about half as toxic as DDT to warm-blooded animals. Further toxicological studies are under way.

Aldrin

COMPOUND 118 or aldrin as it is now known, has been under test for at least two years. The technical material itself is a white crystalline solid possessing a melting point of 100-103°C. It is highly soluble in any light organic solvent but insoluble in water. It is stable in the presence of organic and inorganic alkalis, and stable to the action of hydrated metallic chlorides. Hence, compatibility with most other insecticides is indicated.

Aldrin is readily formulated as a wettable powder, as an emulsifiable concentrate, as an oil solution and as a low percentage dust. Experiments to date indicate that the material is effective in the control of the following general groups of pests:

1) **Soil insects—when the material is used at the rate of 2-5 lbs. per acre, effectively controls wireworms, seed beetles, root maggots, etc.**
2) **For the control of locusts, grasshoppers and crickets—2-4 oz. of the technical compound per acre.**
3) **4 oz. aldrin per acre per application when applied as a dust or a spray, gives excellent control of the cotton boll weevil. For the control of cotton boll worm, aldrin has been combined with toxaphene and DDT.**
4) **It is effective against plum curculio when used in a concentration of 4-8 oz. of toxicant per 100 gals. of formulation.**

Extensive work indicates that the compound is also effective in the control of alfalfa weevil, ants, olive fly, as a larvicide against flies and mosquitoes, and against several species of thrips.

As far as toxicology is concerned, this material must be used with extreme caution and will be treated as a toxic material pending results of further toxicity tests. Work on toxicity has been accelerated by the discovery of a colorimetric method for determining small amounts of aldrin.

The manufacturer indicates that small quantities of material will continue to be available for experimental purposes and moderate production will be available to supply actual quantities needed for use.

Dieldrin

COMPOUND 497 which has been given the common name of dieldrin has also been under test for several seasons. It, too, is a crystalline white solid possessing a melting point of 170-175°C. It is moderately soluble in some of the organic solvents but is insoluble for the most part in the aliphatic petroleum materials.

It is readily formulated as a wettable powder, as an emulsifiable concentrate, as a xylene solution, and as a low percentage dust. The high melting point of the compound makes it easy to formulate as a dust or as a dust concentrate by the usual means. Concentrates above 50% can be prepared readily.

Dieldrin has been found effective against all insects that are controlled by aldrin but the manufacturer points out that dieldrin cannot be recommended for use "against any pests in situations where its residue might constitute a hazard on edible foods or on forage crops." The use of #497, therefore, is recommended for the control of pests in situations where a long residual action is advantageous. It has shown promise, therefore, in connection with the following:

1) **As a fly and mosquito larvicide.**
2) **Against certain lepidopterous larvae including the Southern army worm, several species of cutworms and the boll worm. It can also be used against the cotton boll weevil and certain other cotton pests.**
3) **Effective in the control of soil insects.**
4) **Of interest for the control of insects attacking forest trees and wood products.**
5) **For the control of clothes moths and carpet beetle.**

Chronic toxicity of Compound 497 has not been determined, although tests are now in progress to determine its possible hazard to animals sprayed or dipped in formulations containing varying percentages. The important difference between 497 and 118 is the much higher vapor pressure of 118, with an accompanying higher rate of volatility and a very marked residual property.

Pyrethrum and Synergists

CONSIDERABLE work has been done on the use of Compound 264 as a synergist for synthetic allyl homolog of cinerin I, now known as allethrin. At the Tampa meetings of the AAEE, Dr. Joseph B. Moore of McLaughlin Gormley King Co., Minneapolis, Minn., reported that the effectiveness of allethrin particularly on roaches was increased by the

(*Turn to Page 99*)

Powerful rebuttals describe FTC charges as "unjust" and "unconvincing" as letters continue to arrive from the

Fertilizer Industry

PART II

DIRECT contradiction of many of the charges against the fertilizer industry contained in the report of the Federal Trade Commission issued two months ago, particularly the charge that fertilizer mixers have neglected the sale of "high analysis" fertilizers, is expressed in another series of letters received by AGRICULTURAL CHEMICALS over the past month from leaders of the industry. Continuing the symposium started in our previous issue, we reproduce another group of excerpts from some of these letters to the editor.

Stated briefly, the industry's position would seem to be that fertilizer manufacturers have already gone as far as it is commercially practical to go with high analysis mixtures until a wider consumer demand can be built up for them—and that there is serious danger, not only to the fertilizer industry, but to the entire country as well, in the F.T.C. proposal to put the government deeper into the fertilizer business. Any advance in the idea of the government competing with its citizens, manufacturing products which can and are being supplied adequately by private industry, is branded in vigorous language as another step on the road to socialism—another dangerous move in the direction of an American form of collectivism.

This feeling is well expressed by a leading industry figure who says in part:

"Essentially, the report of the Federal Trade Commission on the fertilizer industry, is just one more step down the political road to socialistic practices that will, if unchallenged, help to bury free enterprise in the muck of bureaucracy. Having suffered long from a chronic case of "all-that's-big-is-baditis," self-promoters and bureau-builders repeatedly have sought excuses to have the government expand its fertilizer business.

"This current effort in the form of an F.T.C. report about "monopolistic practices" and "high distribution costs" is particularly unconvincing when government itself through waste, extravagance and antiquated accounting methods is annually enlarging its tax bite of each American's dollar. As a typical example, the Hoover report shows how new methods of management could reduce postal costs $250,000,000.00; but Congress now is seeking, instead of good management, to increase postal revenues $131,000,000.00 It is only logical to assume that if government were to take over fertilizer production and operate it on a similar basis, taxes would be increased to make up operating deficits and, in addition, substantial tax revenues from private fertilizer industry would vanish.

"With increased costs of labor and transportation, fertilizer prices naturally have increased. *But, based on the government's own figures, fertilizer is still much cheaper than anything the farmer buys or sells.*

"What, then, can government hope to accomplish by expanding its fertilizer business? It could not reduce food costs to consumers. The cost of the fertilizer required to produce a loaf of bread is too microscopic to estimate. But a 15c loaf of bread already includes a tax of 3c; a 21c quart of milk, 8c; a 70c piece of meat, 20c, ad infinitum and certainly these taxes would increase if the government takes over private industry.

"If then, government could only produce fertilizer at an operating loss and at an increase in taxes on all citizens, we can only assume that, even though no farmer seeks it, here again would be a government farm subsidy for the not so pure but certainly simple purpose of political and bureaucratical aggrandizement."

Unjust Attack!

THE F.T.C. report is called an unjust attack on the fertilizer industry in a letter from the president of a Virginia company. "The fertilizer industry," he avers, "has served farmers well during good times and bad, during peace and war." Where would the nation be today, he asks, "if the fertilizer industry had not by resourcefulness, technical skill and hard work expanded its production of plant food to meet the needs of farmers during the war and postwar periods? The task of increasing plant food production from around 8 million tons in 1939 to nearly 18 million tons in 1949 could not have been accomplished if the industry used archaic methods as implied by the F.T.C. report.

"The report fails to cite the achievements and progressiveness of the fertilizer industry. Contrast this with the following statement by a leading scientist from one of our outstanding agricultural colleges—(Richard Bradfield of Cornell University in a talk before the Land Grant College Assn., Kansas City, Mo., Oct. 24, 1949) 'We have a highly developed chemical industry to supply us with high-grade fertilizers at reasonable prices and in practically unlimited quantities. No country has ever had a fertilizer industry comparable to it.'

"A glance at government reports will show that the price of fertilizer is low compared with other commodities entering into the cost of production on the farm. In fact, fertilizer is one of the best buys on the market today. This has been accomplished in spite of increased costs for

This month's fertilizer industry symposium completes the series which started in the February issue with a digest of the Federal Trade Commission's charges against the independent fertilizer industry. The replies to these charges seem perfectly capable of standing on their own merits, as the reader may well judge.

Although the immediate series ends here, this in no way terminates the battle being waged by the fertilizer industry against the encroachments of bureaucratic government.

—THE EDITOR

labor, transportation, machinery, and other items. Furthermore, each dollar invested in fertilizer returns on the average from three to five dollars in increased crop yields.

"In discussing fertilizers, the term high analysis is too often loosely used without a clear understanding as to its meaning. If you ask four authorities from four different regions of the country just what is a high analysis grade, you will get four different answers. A 6-8-4 non-acid forming grade of fertilizer is high analysis in some areas, but would be considered low analysis in other parts of the country. The point is that the composition of fertilizers varies, depending upon the soil, crop, and climatic conditions and the term 'high analysis' does not mean the same thing to everybody.

"The advantages of using higher analysis fertilizers have been pointed out by my company for years and years. Over twenty years ago we carried advertisements in leading farm magazines showing the savings to be derived in costs and handling by using double strength fertilizers. Does this show any reluctance to manufacture and sell high analysis fertilizers?

"Although much progress has been made in using more concentrated fertilizers, especially in the last few years, farmers, due to customs and habits, are usually slow in developing enthusiasm for new grades. This is understandable to those who are familiar with the subject and continued educational programs will do more to solve the problem than anything else. It is not a question of lack of desire to sell, but a question of demand."

Trend Toward High Analysis

ANOTHER Virginia manufacturer denies vehemently that the fertilizer industry has failed to do its part to encourage the trend toward higher analysis products, indicating that those who bring such charges are in many cases uninformed. His statement follows:

"In 1922 a fertilizer producer located in the Mid-West offered for sale one of the first double-strength fertilizers marketed in this country. This fertilizer was the 2-16-2 grade, carrying double the amount of nitrogen, phosphoric acid, and potash per ton supplied by the then very popular 1-8-1. At the present time 2-16-2 would be looked upon as a low analysis fertilizer in this particular territory. No fertilizer containing less than 20 units per ton of nitrogen, phosphoric acid and potash is sold here, and grades carrying up to 40 units are readily available.

"This specific case history is indicative of what has been happening over the entire country. Progress toward higher analysis has been steady and at a satisfactory rate when due consideration is given to the many adjustments involved in this change. For example, the average nitrogen, phosphoric acid and potash content of mixed fertilizers used in the United States increased 56%—from 13.90% to 21.65%—in the 25 year period between 1920 and 1945.

"This progress toward more concentrated fertilizer mixtures has come about as a result of the combined efforts of the fertilizer industry and of agricultural workers representing both public and private agencies. The fertilizer industry has played an important part in bringing about this increase in concentration, is proud of its accomplishments, and feels that it is deserving of praise, rather than criticism.

"Investigation will show that the authors of these criticisms, in almost all cases, either are not well informed about what is being accomplished and the problems involved, or have axes of their own to grind and so are serving their own selfish interests. The criticisms simply are not supported by the facts written in the record of the industry's attainments. Some of the more important of these attainments are as follows:

1. Active support has been given to educational programs to popularize the idea that low analysis mixtures carry large amounts of worthless filler and cost too much per pound of plant food.
2. Highly concentrated materials — concentrated superphosphate, 60% muriate of potash, anhydrous ammonia, ammonium nitrate, urea—have been developed by the industry and put into common use by it.
3. High analysis mixtures have been provided by the industry to fill all customer demands except in times of war emergencies when material shortages over which the industry had no control made this impossible.
4. An active part has been taken in encouraging the adoption by states of mandatory lists that specify the fertilizer grades that can be sold and used. Such mandatory lists, already in effect in many states in the heavy fertilizer consuming territory, give to state agricultural agencies complete control over the grades of mixed fertilizer sold and leave to fertilizer producers only the responsibility of supplying the recommended mixtures. This procedure is the most effective way of increasing the nitrogen, phosphoric acid and potash content of the mixed fertilizers and its extension to other states would be welcomed and actively supported by most fertilizer producers.
5. In states having grade lists that are recommended but not mandatory, the industry has cooperated by providing the recommended grades and by discouraging the sale and use of non-recommended grades. This plan also has been effective in encouraging the use of higher analysis mixtures and has received the active support of the fertilizer industry.

"The fertilizer producer, with a few possible exceptions, looks with favor on the program for increasing the nitrogen, phosphoric acid and potash content of mixed fertilizers and supports this program to the maximum extent that it is consistent with the supply of available materials and with the production of mixtures that are acceptable to his customer and have desirable physical, chemical and crop producing qualities. Unlike many of his critics, however, he is forced to be practical about this and to recognize the serious problems involved.

"In many sections of the country, farmers have been slow to give

(*Turn to Page 86*)

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Agricultural Chemical School

THE training of young men and women as technicians in the general field of plant protection, is the objective of the Long Island Agricultural and Technical Institute, Farmingdale, L. I., New York. The school is now completing its fourth year featuring a curriculum which gives students specialized training in laboratory and field investigation technology which includes intensive study in entomology, plant pathology and weed control.

With the cooperation of the National Agricultural Chemicals Association, the school was organized in 1946 by Dr. Louis Pyenson who looks back over the past four years with a considerable amount of pride. In commenting on the institution and its students, he observes that the field, of pest control is undergoing rapid expansion, and that the need for qualified technicians to assist in research is evident. Persons so qualified are needed to help straighten out the confusion in the minds of growers, by advising on the correct use and application of agricultural chemicals.

"Our students have an excellent background for specializing in this field, since during their two years of training at the Institute, they take basic science courses and have field laboratories and field practice in the planting, cultivation and care of crops," Dr. Pyenson observes. "They learn not only the theory behind crop production, but put it to practice under the supervision of qualified instructors," he continues.

Specialized courses at the Institute consist not only of studies in entomology and plant pathology, but also of insecticides, fungicides, and equipment for application, as well as

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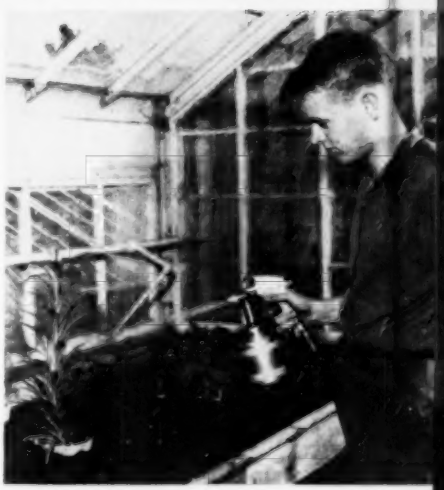

Above: Learning how to operate a sprayer and how to apply pesticides to a tree properly. Students are given thorough training in the various phases of insecticide application.

Center photo: Applying hand spray to a potted lily in greenhouse at Farmingdale.

Bottom photo: Student is shown here taking bulb fly emergence as part of his training in entomology. (All photos courtesy Long Island Agricultural & Technical Institute.)

N. Central Branch AAEE Meets at K. C.

WITH an attendance greater than that of any previous meeting in the group's five-year history, the North Central Branch of the American Association of Economic Entomologists held its 1950 meeting at the President Hotel, Kansas City, Mo., on March 23 and 24. Dr. J. W. Apple, University of Wisconsin, Madison, secretary-treasurer of the Branch, reports that some 335 persons registered at the meeting.

Officers elected at the Kansas City meeting were: C. R. Neiswander, Wooster, Ohio, president; C. J. Weinman, Urbana, Illinois, vice-president; and Dr. Apple, secretary-treasurer. Mr. Neiswander succeeds George M. List as president; Mr. Weinman succeeds Ray Hutson as vice-president; and Dr. Apple was re-elected as secretary-treasurer of the Branch.

A full discussion regarding the residue problems, toxicity of insecticides, and application equipment was held on Thursday morning. L. S. Hitchner, executive secretary of the National Agricultural Chemicals Association, Washington, D. C., and Ray Hutson discussed residue problems, covering the current Food and Drug Administration Hearings in Washington and an industry viewpoint of the implications of the Hearings. T. C. Allen was chairman of a discussion on hazards connected with the application and testing of insecticides.

C. J. Weinman spoke on the influence of formulations on effectiveness of insecticides, and Kenneth Messenger, U.S.D.A. agricultural engineer, presented a paper on the latest developments for application of insecticides.

The afternoon session of the first day was under the chairmanship of Ephriam Hixson, under the general head of insects affecting man and animals. D. E. Howell and E. F. Knipling discussed the control of pests on livestock and in barns, with discussions including stable fly control, their control by chemicals, and reports on "resistant" flies.

The second section, held concurrently, studied truck crop insects with T. E. Bronson as chairman. R. A. Blanchard and A. A. Granovsky spoke on control of corn earworm and cutworm, respectively, and R. L. Post discussed potato insect control.

Control of cereal and forage crop insects was the subject of one of two sections meeting concurrently Friday afternoon, March 24th. Dr. Neiswander was chairman of this section which covered the European corn borer, stored grain pests, grasshoppers, red clover pests, and other miscellaneous insects in sporadic outbreaks. Taking part in this general discusion were H. M. Harris, R. T. Cotton, J. R. Weaver and P. C. Stone

Testimony at FDA Hearings Piles up more evidence that

"Pesticides are Necessary"

THE phase of the Food and Drug Administration spray residue tolerance hearings devoted to testimony by state officials on the necessity of use of insecticides and fungicides in the production of fresh fruits and vegetables is now completed. During this portion of the proceeding a very complete and forceful case has been developed establishing that commercial production of fruits and vegetables would be impossible without the use of insecticides and fungicides. The record of the evidence presented by state officials, consisting of several thousand pages of oral testimony and supported by approximately eight hundred exhibits, is considered to be the most complete and up-to-date accumulation of data relating to the entomology and plant pathology of fresh fruits and vegetables. It will undoubtedly be used extensively during the coming years as a library of such material. The office of the Hearing Clerk of the Food and Drug Administration maintains a permanent file of this material.

The second phase of the proceeding will consist of testimony by representatives of various associations and growers. The presentation of evidence compiled from the various states by the American Phytopathological Society is scheduled to start during the week of April 24.

This will be followed by testimony by witnesses from chemical companies relating to the necessity for use of specific products which they manufacture. The entomologists and pathologists from the various states discussed the necessity of use primarily from the standpoint of the conditions existing in their own states.

A brief resume of this testimony is outlined below.

Following the testimony of Dr. Douglas E. Greenwood on February 24, Dr. Ancell B. Groves, plant pathologist at the Virginia Agricultural Experiment Station, testified concerning difficulties encountered in the commercial production of apples and cherries. In his discussion he stated that the grower must combine insect and disease control and listed the considerations involved in the selection of a satisfactory fungicide. No single fungicide can be used satisfactorily on apples under all conditions throughout the growing season, he said.

Clarence H. Hill, also of the Virginia Agricultural Experiment Station, discussed control of insects on apples, peaches and plums. He submitted considerable data including an exhibit covering residual data of several insecticides on apples, comparison of their effectiveness and removal of various insecticide residues from fruit.

Dr. Philip Garman, entomologist, Connecticut Agricultural Experiment Station, discussed residue problems arising from the use of insecticides on fruits and vegetables. He stated that many crops could not be produced without the use of insecticides but no one chemical now in use can be considered indispensable.

The next witness was Frank J. McFarland, Assistant to the Secretary of Food and Drug Administration's Food Standards Committee whose field inspectors have collected samples of apples, pears, grapes and cranberries in order to determine how much residue could be removed from these fruits. On the basis of these samples, all collected in 1947, reports of residues of lead, arsenic, DDT and parathion were drawn up, and Mr. McFarland's testimony consisted of summaries of these reports.

N. Y. Testimony Heard

A NUMBER of representatives of Cornell University and the New York Agricultural Experiment Station appeared as witnesses following Mr. McFarland. Dr. Charles E. Palm, Cornell, was the first witness for the State of New York. He outlined the manner in which the testimony would be presented by his fellow witnesses and described the entomological operations of the State Experiment Stations and Cornell University.

He was followed by Dr. Leland B. Norton, of Cornell. Dr. Norton pointed out that entomologists have recognized the problem presented by residues of organic insecticides, and have devoted considerable time to such study. Efforts have been made to secure data on the distribution of residues in different samples, the part of the plant where residue is concentrated, the effect of weathering on residues, and the amount of residues on vegetables at harvest. He

by

John D. Conner

Special Counsel, National Agricultural Chemicals Association, Washington, D.C.

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suggested that in setting the tolerances, specific reference should be made to the part of the plant to which the tolerance applies, that allowance be made to compensate for varying application conditions, and that the sampling procedure be specified in detail in order to assure uniform samples.

The next witness for New York was Dr. A. W. Avens, Cornell, who has supervised spray residue work since 1945. He elaborated on methods used in analyzing residues of several insecticides.

Dr. Paul J. Chapman, Cornell, developed the broad over-all picture of the part played by insecticides in the economics of fruit growing. The fruit grower is confronted on the one hand, he said, with rigid commercial standards for his product and, on the other, with the standards of the Food and Drug Administration and state agencies on insect contamination and spray residues. Not only are pest control methods imperfect and in constant need of revision but the ability of pests to develop resistance to toxicants is an ever-present check on chemical controls.

Dr. Edward H. Glass, New York State Agricultural Experiment Station, listed some of the insecticides used to control pests of apples. His testimony was based upon information compiled from fifty years of research work.

Dr. Ralph W. Dean, of the Experiment Station, described the extent of infestation of apples and plums and discussed damage done to these fruits as well as to other orchard crops.

Dr. Edward H. Smith, also of the Experiment Station, listed pests which attack peaches in New York and made recommendations for their control. He also discussed pests of plums and quinces. Dr. E. Frederick Taschenberg, of the Station submitted information on residues from some insecticides and said he expects to have additional data at a later date.

The testimony of Dr. William A. Rawlins, Cornell, discussed various pests on potatoes and insecticides for their control. Several new materials are being tested he said, and recommendations on these may be made in April.

Dr. A. B. Buchholz, New York State Department of Agriculture, testified that while farmers are interested in keeping residues down to a reasonable level, the established tolerances should be flexible to meet new problems as it may be necessary to make rapid changes in recommended practices.

Dr. George E. R. Hervey, Cornell, testified on insect pests of cabbage, snap beans, cucurbits, and miscellaneous vegetable crops. He was followed by Dr. Hugh C. Huckett, also of Cornell, who has spent twenty-eight years on insect problems on Long Island. He testified on insect pests affecting cauliflower, broccoli, brussel sprouts, turnips, lima beans, eggplant and peppers. George D. Butler, Jr., a graduate student at Cornell, testified on insects attacking peas and corn.

Dr. R. W. Leiby, Cornell, stated that his work is the making of recommendations for control of insects affecting crops in New York State, and described the procedure involved in drawing up such recommendations.

Dr. James M. Hamilton, Cornell, testified on diseases of tree fruits. He described a satisfactory fungicide as being non-toxic to the operator; and compatible with insecticides. Dr. D. H. Palmiter, Cornell, enlarged upon the subject by stating emphatically that apple scab cannot be controlled in New York without the aid of fungicides. In his opinion, he said, the use of insecticides does not increase the incidence of any of the plant diseases. Dr. Kenneth G. Parker, Cornell, discussed his work on shade and fruit trees diseases and methods of control used.

Dr. W. D. Mills, Cornell, discussed insecticides and fungicides used to control pests and diseases of apples, and sweet and sour cherries; while Dr. Alvin J. Braun, of the Experiment Station, listed diseases of small fruits in New York requiring spray application for control. His testimony covered raspberries, grapes, currants, gooseberries, strawberries and blueberries.

Dr. Wilbur T. Schroeder, Cornell, discussed research work done by him on tomatoes, peas, corn, beets, lima beans, spinach, carrots and other vegetables. Dr. Charles Chupp, Cornell, testified on vegetable fungi control. Dr. Allen J. Newhall, Cornell, discussed diseases and pests affecting celery, carrots, lettuce, and effective methods of controlling these insects.

Dr. Karl H. Fernow, Cornell, testified on potato diseases and effective fungicides for their control. In discussing testing of new materials, he stated that one fungicide gave good control in Florida but failed to control under New York conditions.

Dr. Henry J. Franklin, in charge of the Cranberry Station of Massachusetts, confined his testimony to insects and diseases preying on cranberries. He submitted recommendations for control based on research work carried on at the Station.

Warren D. Whitcomb, Research Professor, Massachusetts Agricultural Experiment Station, discussed the production of apples, peaches and pears, the insects and diseases affecting these fruits and recommended controls in his state.

New Jersey Represented

A STRONG representation from the New Jersey Agricultural Experiment Station and Rutgers University presented testimony on conditions in that area. Dr. Stacy B. Randle, State Chemist, opened the presentation, stating that in view of the economic importance of New Jersey's fruit and vegetable production, growers *must* protect their crops against insects and diseases and, therefore, have given increased attention to proper means of accomplishing this.

Dr. B. F. Driggers, New Jersey Experiment Station, presented detailed information on the economic importance of the state's fruit crop and the injury caused if insects are not controlled. His testimony included a discussion of the various chemicals used in the control of apple, peach, grape, strawberry, cherry and raspberry insects.

Arthur J. Farley, Rutgers, discussed the history of insect and plant disease control in New Jersey. He stressed that entomologists would not recommend, and growers would not use insecticides unless their use was absolutely necessary. Dr. Robert H. Daines, Rutgers, presented testimony relating to diseases of apples, peaches, cherries and sweet potatoes and methods for their control.

Dr. Bailey B. Pepper, Rutgers, discussed insect problems encountered in the production of fresh vegetables. His testimony related specifically to tomatoes, peppers, cucurbits, asparagus, leafy vegetables, white potatoes, sweet potatoes, onions, leeks, horseradish, rutabagas, turnips, carrots, celery and edible legumes, sweet corn and mushrooms.

Dr. C. Martin Haenseler, Rutgers, discussed plant diseases of vegetables, bush fruit and grapes. He presented testimony on their control by seed treatments, soil treatments, and treatment of the growing plants.

William E. Tomlinson, Jr., of the Cranberry and Blueberry Laboratory, was the concluding witness for the State of New Jersey. He discussed the insect pests of those crops and their control.

Dr. Fred W. Poos, U. S. Department of Agriculture, presented testimony relating to the control of insect pests of soybeans and peanuts. His testimony included a discussion of research work on the use of some of the newer organics to control these pests.

Fla. Group Speaks

WILLARD M. FIFIELD, Director, Florida Agricultural Experiment Station, opened the Florida presentation. He pointed out that Florida is in a vulnerable position from the standpoint of introduction of foreign plant pests and diseases, urging that the list of products approved for use by the Food and Drug Administration be as all-inclusive as possible.

Dr. C. V. Noble, University of Florida, presented detailed data on the production and economic importance of Florida fruits and vegetables. Dr. E. G. Kelsheimer, of the Florida Station, presented testimony concerning the use of insecticides on sweet corn, tomatoes, cabbage, cauliflower, pepper and squash.

Dr. John W. Wilson, of the Central Station, discussed the improved control of vegetable insects made possible by the newer insecticides. He stressed that entomologists need freedom, within safe limits, in the choice of insecticides to meet the continually changing pest control problems.

Norman C. Hayslip, Everglades Station, discussed the insect problems in vegetable production in his area. Every commercial vegetable grown in the area requires the use of insecticides but weather conditions and other factors vary so much that no attempt has been made to outline specific recommendations, he said.

The testimony of Dr. Daniel O. Wolfenbarger, Sub-Tropical Station, covered insect pests of both vegetable and fruit crops in southern Florida. Dr. Wolfenbarger stated that the climatic conditions in southern Florida make it impossible for growers to adhere to a rigid control program.

Dr. A. N. Tissot, of the Experiment Station, testified concerning insect pests of peanuts in Florida, and Dr. James M. Walter, of the Vegetable Crops Laboratory, discussed the plant diseases of vegetables and the various chemicals used in their control. Dr. George D. Ruehle, of the Sub-Tropical Station, discussed the plant diseases of potatoes, celery, grapes, strawberries and other subtropical fruits other than citrus.

Joffre C. David, Florida Fruit and Vegetable Association, discussed the economics of the Florida winter vegetable industry. He presented data to show the high cost per acre of growing winter crops in Florida, and stressed the necessity of controlling various insects and diseases in order to assure a profit on these crops.

Robert C. Evans, Florida Citrus Commission, opened the presentation of evidence relating to citrus. He described the organization and functions of the Commission and discussed the economics of the citrus industry. Dr. Ralph L. Miller, of the Plymouth Citrus Growers Association, presented testimony concerning the necessity of using chemicals in the production of citrus.

George F. Westbrook, Florida Department of Agriculture, discussed the use of arsenic to advance the maturity of grapefruit. Mr. Westbrook stated that although his Department cannot make recommendations for or against the use of any agricultural material, evidence shows that use of arsenic on grapefruit in the quantities currently employed does not constitute a health menace, nor does it affect adversely the nutritional value of the fruit.

Dale Talbert, Indian River Products Company, discussed the materials used in his spray schedule, and Howard A. Thulbery, Superior Fertilizer Company, discussed the change which has taken place in the citrus industry in the last twenty years in reference to the chemicals used.

Dr. A. F. Camp of the Citrus Experiment Station, discussed the insecticide, fungicide, nutritional and physiological sprays which are being used currently in the production of citrus. W. L. Thompson, of the Citrus Station, discussed the rapidly changing nature of insect problems in citrus. Dr. James T. Griffiths, Jr., Citrus Station, discussed the occasional insect pests of citrus. Dr. R. F. Suit, Citrus Station, presented evidence to show the necessity of using copper fungicides in the control of citrus diseases. Charles R. Stearns, Jr., Citrus Station, discussed data relating to parathion residues on citrus fruit. Alvin H. Rouse, Citrus Station, discussed the removal of residues from the surface of citrus fruit by washing.

Willard D. Miller, Florida Fruit and Vegetable Growers Association, headed a list of several grower witnesses who presented testimony concerning the necessity of using insecticides in the production of Florida vegetables. Mr. Miller drew attention to losses which could be

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Technical Briefs

Seed Treatment Tested

Studies begun in 1946 have been made to determine the efficacy of seed treatments for the control of wireworms in California. Laboratory tests in conjunction with field work indicated that of the chemicals tested —namely, parathion, lindane, technical BHC, aldrin, dieldrin, DDT and chlordane, the purified gamma isomer of benzene hexachloride, or lindane, was the most promising from the standpoint of tolerance, safety, and insecticidal efficiency. Of the others tested, aldrin, dieldrin, and parathion need further investigation, particularly in regard to phytotoxicity.

Of the different methods used in treating seed with lindane, liquid applications, such as suspensions or solutions, were found more adaptable because of the greater adherence and evenness of distribution of the chemical on the seed, greater safety to the operator, and insecticidal efficiency.

The tolerances of different seeds to lindane were found to vary markedly. Injury from lindane at dosages greater than those suggested included delay in germination, stunting of the plants, non-absorption of the cotyledons in the case of certain varieties of beans, and reduction in seedling weight.

The insecticidal effectiveness of chemical seed treatments was determined in the laboratory by exposing wireworms to treated seeds and, in addition, by checking mortality under field conditions.

Laboratory work using *Limonius canus* larvae indicated that of the pure isomers of benzene hexachloride tested — namely, alpha, beta, delta, and gamma — the gamma isomer was the most effective in killing wireworms.

Field observations suggested that not all wireworms are equally affected by the gamma isomer of benzene hexachloride. This finding was confirmed by exposing several species to soil treated with lindane. The most susceptible was an *Aeolus* sp., followed in order of their decreasing susceptibility to lindane, by *Limonius canus, L. californicus,* and *Anchastus* sp.

Combination insecticide-fungicide treatments were feasible and often resulted in increased stands in the field, due to a dual control of wireworms, seed borne fungi, or preemergence damping off organisms. Lindane was combined satisfactorily with "Arasan," "Semesan," "Spergon," "Ceresan M," "Phygon" and yellow cuprous oxide.

Field tests indicated that one seed treatment at the suggested dosages of lindane killed from 70 to 95 per cent of the wireworms within the immediate area of the treated seed and reduced the population of wireworms about 50 per cent.

—W. H. Lange, Jr., E. C. Carlson and L. D. Leach, University of California, Davis, in *Journal of Economic Entomology,* December, 1949.

•

Copper Aids Tobacco Yield

Adding copper to the usual fertilizer applications for tobacco has resulted in increases in both yield and quality of the crop, according to experiments conducted at the Windsor Tobacco Laboratory of the Connecticut Agricultural Experiment Station.

Preliminary tests made in 1947 showed that 36 pounds of copper sulfate per acre gave as much as 30 per cent greater crop value, compared with plots where no copper was used. Crop value is figured on a yield plus grading basis. Experiments in 1948 and 1949 confirmed the earlier results. The latest figures show that a 20 pound rate per acre added 26 per cent in crop value. Breaking this down, yields were increased about 175 pounds per acre and the grading value was boosted about 7.5 cents per pound at 1949 prices.

Tests were conducted to see how continuous use of copper affected tobacco grown in this region. Burn is particularly important since practically all tobacco grown in the Valley is used for cigar manufacture. Burn tests showed that copper-treated tobacco burns equally as well as tobacco receiving no copper.

Following copper applications, soil analyses revealed that the major part of the element becomes fixed in the soil. Active or available copper found amounted to only 0.2 ppm when 18 pounds of copper sulfate were applied and 1.2 ppm when 54 pounds were used. At the 20 pound rate, found most practicable, an accumulation of active copper which might have an adverse effect on soil conditions, seems unlikely. It was also found that copper deposited in the leaves actually decreased as rates of application increased.

•

Root Weevil Controlled

Control of the strawberry root weevil, serious pest in nurseries, has been accomplished through applications of chlordane and benzene hexachloride, according to a report by John C. Schread, Connecticut Agricultural Experiment Station entomologist. He said that "excellent control of the pest" was obtained by low dosages of either insecticide, which gave complete kill of the weevil.

•

Spray Combinations Tested

Tests were conducted during 1949 with a number of insecticide-fungicide combinations to determine the safety with which they might be used on apples. A summary of the results with the brands and formulations used is as follows:

1. "Rhothane" emulsion was used with parathion, Toxaphene, DDT, Methoxychlor ("Marlate"), sulfur and "DN-111" on Jonathan and Golden Delicious without injury due to the combination. There was some spotting on Jonathan from the "Rhothane" - parathion combination but it was the same type as produced by parathion not in combination with "Rhothane." With high temperatures there was sulfur burn on fruit and foliage from the sulfur-"Rhothane" combination but there was no indication of injury from the combination itself.

2. "Diatox," another brand of

(*Turn to Page 95*)

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1949

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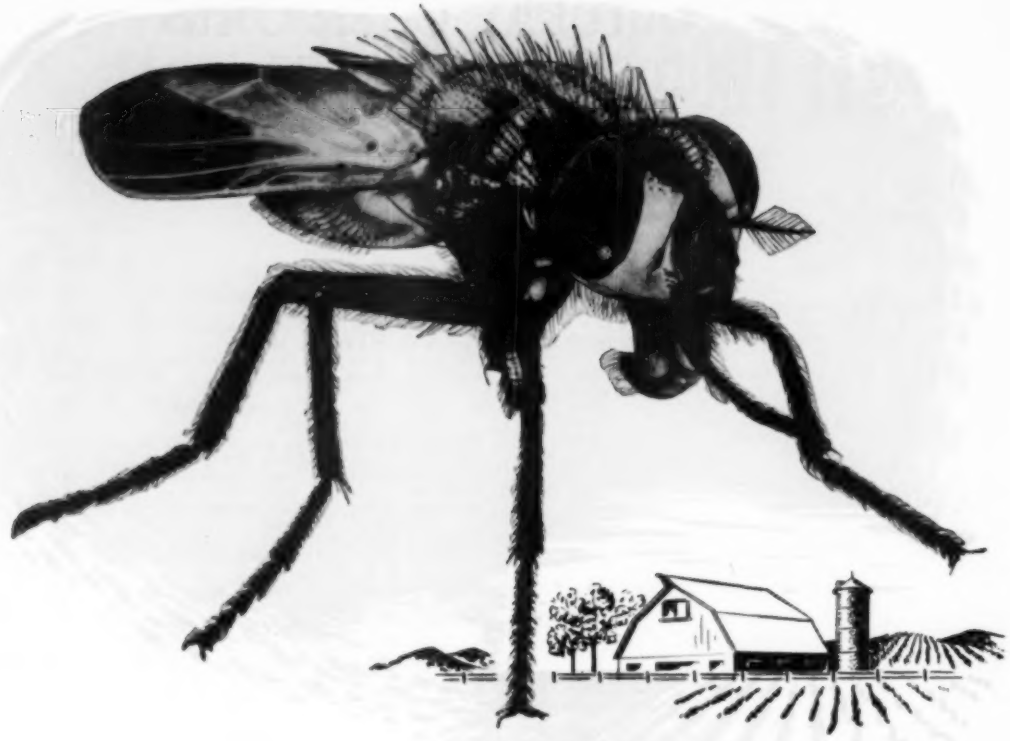

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The Listening Post

Insect Conditions During February

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

ADULTS of the Mexican bean beetle appeared on early-planted beans in Gadsen County, Florida during the second week of February. This was the earliest record of the appearance of the insect in that location. They were fairly numerous and laying eggs on early snap beans in Gadsen and adjacent counties around the middle of the month. The numbers decreased later, however, following a heavy frost which damaged the beans. Moderate numbers of the bean leaf roller, potato leafhopper, thrips, banded cucumber beetle, lima-bean pod borer, serpentine leaf miner, and cutworms were present on beans in Florida, and a light infestation of the lesser cornstalk borer was reported attacking beans in that State. A light infestation of aphids occurred on beans in South Carolina toward the end of the month.

Moderate to heavy populations of aphids infested crucifers in many parts of the south during February. In most areas the infestations were on the decrease toward the end of the month due to natural enemies, insecticide applications, and in some places, lower temperatures. Aphids were also numerous in some fields of crucifers in southern California.

Moderate to heavy infestations of the vegetable weevil persisted on crucifers in many parts of the South from Virginia to Louisiana. Cabbage caterpillar populations were generally light early in February, except in southern Louisiana, but were on the increase in most areas as the month progressed. They were reported to be causing considerable damage in Louisiana toward the end of February. Only light infestations of these caterpillars were reported on cole crops in southern California. Early in the month the southern green stink bug was infesting collards in Louisiana, and severe infestations of the striped flea beetle occurred on mustard and turnip in the southern part of that State. The yellow-margined leaf bettle was very abundant and causing serious damage to turnips, cabbage, and collards in Jackson and George counties in Mississippi. Other insects reported occurring on crucifers in parts of the south included the garden fleahopper, harlequin bug, serpentine leaf miner, and cucumber beetles.

The serpentine leaf miner also caused damage to watermelon, squash, pepper, potato, and tomato in Florida throughout the month. Heavy infestations of the two-spotted spider mite were present on strawberries in Virginia and Louisiana, and this pest was also reported infesting that crop, though in lesser numbers, in southern California. Moderate infestations of these mites occurred on eggplant and sweet potato in Florida.

Onion thrips were seriously infesting onions in Louisiana toward the end of February, and were reported in lesser numbers on that crop in Virginia, South Carolina, and California.

Aphid infestations ranging from light to heavy occurred on pepper, eggplant, potato, and tomato in Florida. Infestations of the pea aphid on peas were reported from Louisiana, Alabama, South Carolina and southern California. A light infestation of aphids occurred on lettuce in the latter area and the sugar beet wireworm was also reported reducing that crop there.

Larvae of the green June beetle were unusually abundant in tobacco plant beds in South Carolina early in February, and they also caused some injury to tobacco plant beds in Florida. Mole crickets were unusually abundant in these beds in South Carolina, Georgia, and Florida. Other insects reported infesting tobacco in plant beds included the vegetable weevil in Florida, Georgia, and South Carolina; whiteflies in Florida; and midge larvae and slugs in South Carolina. Toward the end of February aphids were reported infesting some tobacco plant beds in northwestern Florida. The relatively large numbers of the green peach aphid present on volunteer tobacco plants which survived the winter in that area and in Georgia, indicate the possibility of another outbreak of the insect on tobacco during the coming season.

Greenbugs Advancing

THE greenbug outbreak that occurred in 1949 was reviewed in this column in the February, 1950 issue. This insect is getting an early start in 1950 as a result of favorable weather during the winter. Many thousands of acres of winter wheat and other small grains in Oklahoma, northern Texas, and southern Kansas are already infested and control measures are being applied in many areas.

The European corn borer is overwintering in greater numbers than ever before in many parts of the Corn Belt. In Illinois there are said to be three times as many borers going over the winter as compared to a year ago. In some counties there are 10 times as many. In Iowa, borer numbers are reported to be at the highest level in history.

The sugarcane borer is overwintering in much greater numbers

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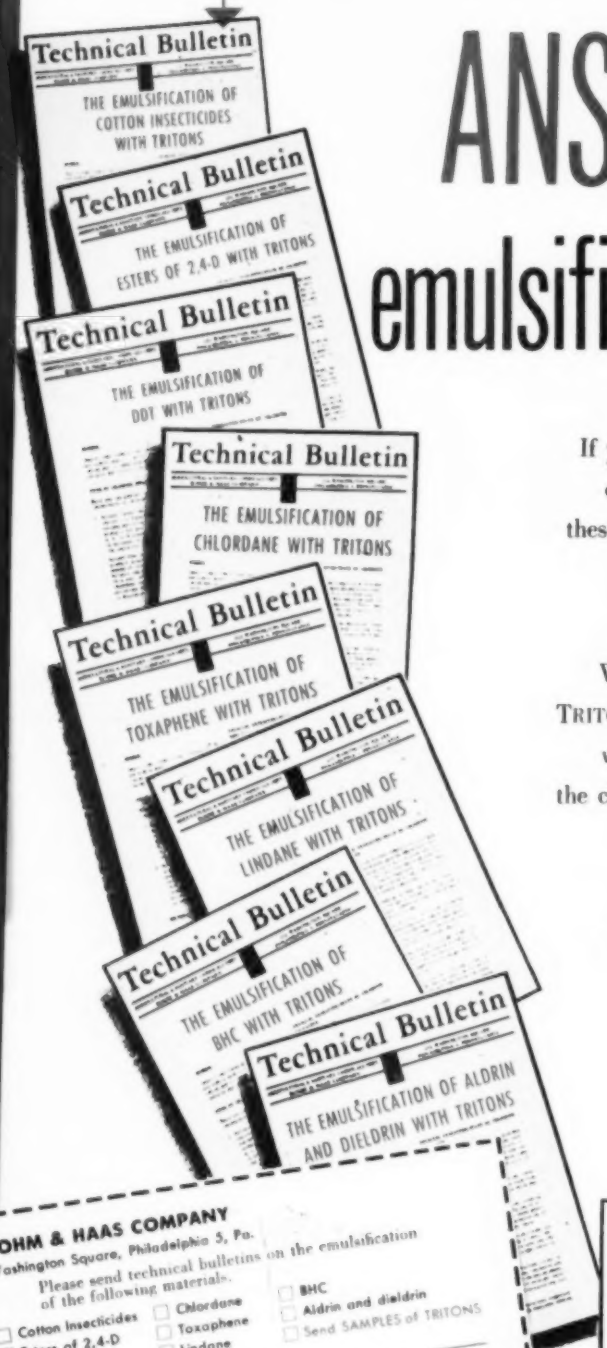

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than last year, according to reports received from Louisiana. An outbreak of armyworms was reported from north Georgia during February, apparently as a result of mild weather. These pests were attacking grain crops in Gordon, Murray, and Towns Counties. Some farmers reported that parts of their wheat and oat crops were completely destroyed.

Oak Tree Disease Proves Difficult to Control

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

DEATH of oak trees in forests and plantings in the north-central part of the country has been noticed for 20 years or more. As is often the case with such diseases, the real cause was difficult to find. Whether the particular disease now known as oak wilt was responsible for all the mortality cannot now be said, but judging from what has since been discovered about its activity, there is a strong probability that it was associated with at least a major portion. The cause of oak wilt was definitely determined within the past ten years as the fungus *Chalara quercina*.

The accompanying map shows the area in which this oak wilt has been found since its first identification. Active search would probably show much more widespread occurrence. The map shows known locations only and does not indicate severity. In some places there have been only a few spot infections; in others the disease has spread rapidly and destroyed large stands.

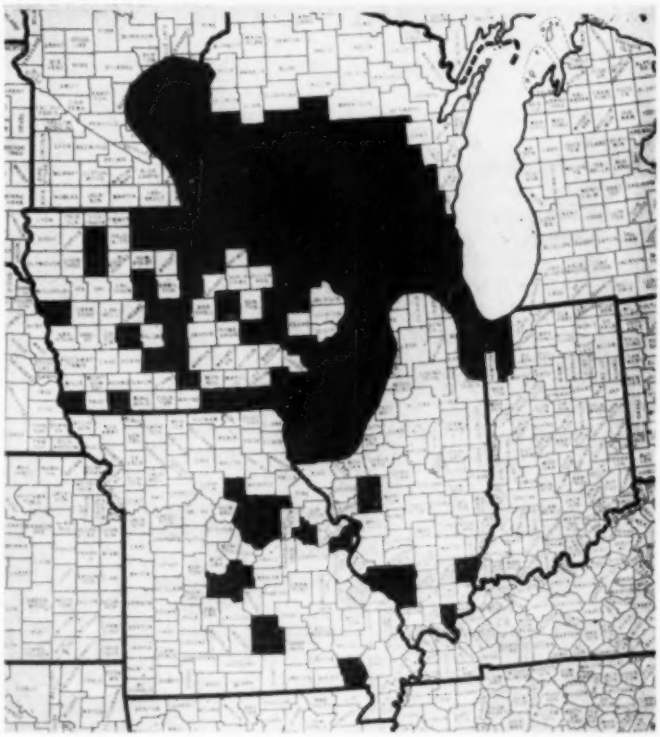
Different kinds of oaks are affected differently. The disease spreads very rapidly in thick stands of the very susceptible red oaks and black oaks; bur oaks are killed more slowly as a rule, while white oaks are very resistant. Spacing of stands and trees affects spread. The fact that the manner of spread from one locality to another has not been discovered as yet hampers control. Within a stand of oaks the fungus can spread from a diseased to a healthy tree through naturally grafted roots.

As an example of the rapidity of destruction caused by oak wilt, J. C. Carter of the Illinois State Natural History Survey cites a privately owned hardwood forest of 1700 acres in northern Illinois. In this forest oak wilt was first found in 1946, on a few scattered dead and dying trees in three separate locations. The scarcity of infection indicated that the disease had been present for only a year or two. In subsequent years attack has increased greatly. The number of trees killed during the six or seven years that wilt has been present, if standing together, would cover an area of about 50 acres. An effort is being made to salvage the oaks killed by wilt in this forest. It was estimated in January 1950 that 50,000 board feet of lumber have been obtained already and that another 50,000 board feet remain for salvage in wilt-killed trees.

Tree Diseases in Colo.

W. D. THOMAS, JR., of the Colorado Agricultural Experiment Station, reports several diseases recently found on shade trees in Colorado. One green ash tree in Den-

Oak Wilt distributed over large midwestern area



ver was affected by wilt caused by the soil-borne fungus *Verticillium albo-atrum*. This disease is common on elms and maples of this area, but apparently had not been reported on ash previously.

A second disease was a leaf spot on staghorn sumach. Badly infected leaves became yellow and fell prematurely. The disease was limited to a few trees in widely separated areas in Denver and has not been observed elsewhere. Although it did not appear to be serious, it did cause severe defoliation of several trees. Cause of the leaf spot has been identified tentatively as a fungus, *Alternaria tenius*.

In Fort Collins, Colorado, another wilt fungus, a *Fusarium* not specifically determined, was obtained from two adjacent staghorn sumachs. The trees wilted in the afternoon heat, and recovered each night. Within two weeks after the first wilting occurred the lower leaves became yellow, and then dropped off a week later. There was no indication of drought, for the trees had been watered well twice each week. Although no controlled experiment was conducted in an effort to control the disease, "Dithane Z-78" was applied at the base of one of the trees at the rate of 5 pounds per 100 square feet. The dust was worked into the soil and the treated area soaked thoroughly. Despite excessive heat during this period, all symptoms of the wilt had disappeared within three weeks following treatment. The untreated tree wilted further, finally dying before the summer's end.

Tests With Antibiotic

D. PETERSEN and D. Cation of Michigan State College report results of exploratory tests on the use of "Acti-dione" for the control of peach brown rot and cherry leaf spot. This material is a chloroform and water soluble antibiotic that is produced by streptomycin-yielding cultures of *Streptomyces griseus*. It possesses no marked antibacterial activity but is highly active against a large number of fungi. The chemical name of the compound, which has been obtained in pure crystalline form, is cycloheximide. "Acti-dione" is the patented trade name of the Upjohn Company.

For the control of peach brown rot (caused by *Monilinia fructicola*), concentrations of 2, 5, and 10 ppm of "Acti-dione" were applied in four sprays as a pre-harvest fungicidal program, on 12-year-old Elberta trees at 10-day intervals beginning one month before harvest and ending the day before picking. Samples of firm-ripe fruit were placed in cold storage (34°F.) for two days and then removed to common storage for four more days. Counts at the end of the six days storage gave the following percentages of brown rot: 2 ppm, 2; 5 ppm, 0; 10 ppm, 1; control, 7. A grower program of one liquid lime-sulfur spray (3 quarts in 100 gallons) and three sulfur dusts under like conditions resulted in 3 percent rotted fruit.

Another experiment for brown rot control was conducted under conditions of heavy infection in a Halehaven orchard that previously had received no fungicides. An actual count showed 11 percent rotted fruit hanging on the trees two days before harvest when the experimental sprays were applied. "Acti-dione" at 20 ppm was compared with wettable sulfur (5 lbs. in 100). At the same time the grower sprayed the remaining trees with liquid lime sulfur (2 qts. in 100). Rot counts after two days in cold storage (34°F.) and three days in common storage showed 84 percent rot with "Acti-dione" and 67 percent for wettable sulfur. The grower-sprayed peaches showed 89 percent rot; this cannot be compared accurately with the count on the other two samples as the gallonage per tree was definitely less for the grower applications.

In these two experiments, "Acti-dione" showed indications of some control of brown rot in the first test but was inferior to wettable sulfur in the second. Although foliage injury was not noted at any of the concentrations of "Acti-dione" used, the 20 ppm concentration cracked firm-ripe Halehaven peaches severely. The cracks, often a quarter-inch deep, varied from one to six per fruit and radiated in many directions. Greener fruit was less severely affected. Elberta fruit cracked less than Halehaven. The severity of the injury decreased with reduced concentration. In addition to the cracking, "Acti-dione" caused a mottling of the fruit, apparently dissolving the red coloring of the skin. It would appear from the severe injury to near-ripe fruit that this material is of doubtful value as a spray for brown rot control.

In another test, "Acti-dione" at the rate of 2, 5, 10, and 20 ppm was compared with wettable sulfur (5 lbs. in 100) and liquid lime-sulfur (3 qts. in 100) as a dip after picking to control brown rot. Two-bushel samples of Rochester peaches were dipped for approximately 30 seconds in the various solutions. After draining for one-and-a-half hours, the samples were placed in common storage for five days. The percentages of rot counted after storage, for the various treatments in the order listed, were 95, 84, 95, 90, 86 and 80; in addition fruit dipped in plain water showed 97 percent rot and fruit not dipped 94 percent. Thus none of the materials used in the post-harvest fruit dip trial materially reduced rot. It was of interest to note that "Acti-dione" did not crack or mottle the fruit when used as a dip on the Rochester variety.

"Acti-dione" was also tested by the same workers as a control for cherry leaf spot (caused by *Coccomyces hiemalis*). Concentrations of 1, 5, and 10 ppm were applied to three-year-old Montmorency cherry trees heavily infected with leaf spot. Other plots received "Tennessee 26" copper (3 lbs. in 100), ferbam (1½ lbs. in 100), "Crag Cherry Fungicide 341B" (2¼ lbs. in 100), and nabam (1 qt. plus 1 lb. zinc and ½ lb. lime in 100). The trees had not been sprayed during the season; consequently, nearly 100 percent of the leaves were infected and the trees were about 20 percent defoliated by August 29 when this experimental spray was applied.

The final check on results, on October 4, revealed that "Acti-dione" at 10 ppm had delimited all leaf spot

(*Turn to Page 97*)

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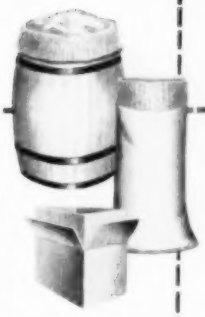

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INDUSTRY NEWS

P. N. Annand Dies: Hoyt Named Acting Chief of USDA Bureau of Entomology, Plant Quarantine

Dr. Percy N. Annand, 51, chief of the U. S. Department of Agriculture Bureau of Entomology and Plant Quarantine, died March 29 at Arlington, Va., following a long illness. Dr. Annand had been chief of the bureau since August 16, 1941. It was under his direction that many of the recent advances in the control of insect pests have taken place. These included the development of the insecticidal use of DDT, aerosols for household, greenhouse and field use, and the practical dispersal of liquid insecticides from aircraft.

DR. P. N. ANNAND

AVERY S. HOYT

Before joining the U. S. D. A. in 1929, Dr. Annand had engaged in research work on sugar beet insects for a sugar company from 1920 to 1921. For the next eight years he was a member of the staff of San Mateo Junior College, and during the latter part of that period, headed the college's Department of Biological Sciences.

During his early years in the Bureau, Dr. Annand conducted further research on the sugar beet leafhopper in California and Idaho, and in 1932 was called to Washington to take an administrative position. He headed the Division of Cereal and Forage Insect Investigations from 1934 to 1937. During the next two years, as special research assistant to the chief of bureau, he served as coordinator of all research. He was named assistant chief of the Bureau in 1939, and was appointed to the position of chief by the Secretary of Agriculture two years later following the death of his predecessor, Dr. L. A. Strong.

A native of Telluride, Colorado, Dr. Annand was graduated with a B.S. degree in 1920, from Colorado Agricultural College where he specialized in entomology. He received an M.A. degree in entomology from Leland Stanford University in 1922 and a Ph.D in zoology and botany from the same institution in 1928.

A brother, Robert N. Annand, is a plant quarantine inspector with the B.E.P.Q. at Lufkin, Texas, and another brother, J. W. Annand, is a physician in Los Banos Calif. In addition, he leaves his widow and two children.

HOYT ACTING CHIEF

Dr. P. V. Cardon, Administrator of the Agricultural Research Administration of which the B.E.P.Q. is a part, has announced that Avery S. Hoyt, Associate Chief of the Bureau, will continue as Acting Chief of Bureau as he had done during Dr. Annand's illness. A permanent Chief was to be named later.

Mr. Hoyt is a native of San Diego, Calif., and a graduate of Pomona College. He held various positions with the California State Department of Agriculture, becoming Director in 1931.

Later that year he became Assistant Chief of the U.S.D.A. Plant Quarantine and Control Administration, a position which he held until 1934 when that Bureau was consolidated with the former Bureau of Entomology into the present Bureau of Entomology and Plant Quarantine. Since August 16, 1941, he has served as Associate Chief of the Bureau.

•

Purdue Course Held

Purdue University, Lafayette, Indiana, held its second annual short course for operators of aerial agricultural spraying and dusting equipment on March 30 and 31. The first half day was devoted to a discussion of the fundamental needs of aircraft operators who plan to do agricultural pest control work, while the afternoon session took up the business of the industry, including regulations and ethics involved in such operations. A long evening session, from 7 to 11 p.m., was featured by free-for-all discussions on operational problems.

Friday morning's program consisted of a session showing how aircraft could be used for various agricultural operations. In the afternoon, three commercial operators, Bob Ueding, George Davis and Nick Jankovich, demonstrated the techniques of spraying, dusting, and applying fertilizer and seeding from the air at the Purdue airport near the University.

•

Kansas Weed Conference

Combining theory and research with practical usage was the achievement of the 12th Annual State Weed Conference held February 15 and 16 at Topeka, Kansas, according to T. F. Yost, State Supervisor for the Kansas State Board of Agriculture. The first day of the meeting was for

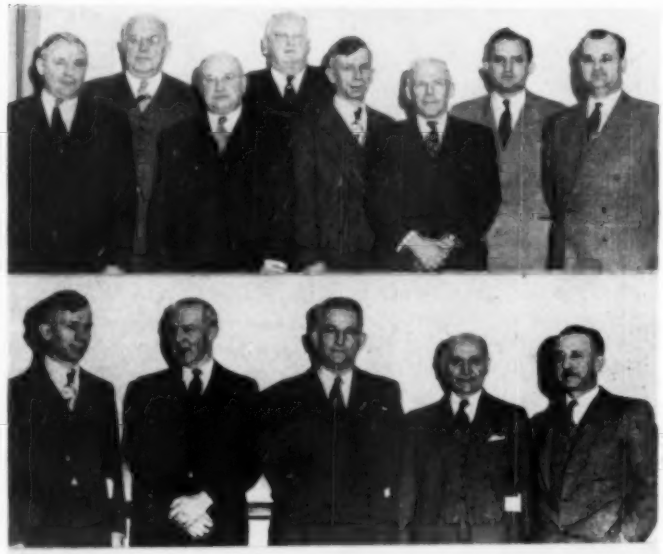
farmers with a program presenting solutions to some of their problems of weed control.

The treatment of weeds in grain fields, pastures, roadsides and elsewhere was one feature of the day's program. At the same time other studies of weed work, spraying machine problems and the discussions on dangers of volitilization and drift were being held for the farmers' benefit. As an added attraction of the convention weed plant identification, weed seed identification and related contests were held and prizes awarded.

The evening of February 15th was devoted to the annual banquet with Roy Freeland, secretary of the Kansas State Board of Agriculture, serving as toastmaster. Before the farmers, weed supervisors, and county commissioners present, recognition was given to a large number of the county weed men for their long and outstanding records of service. Two guest speakers, Chas. J. Gilbert, South Dakota State Weed Supervisor, and Virgil Hill, well known Topeka *Daily Capital* editor, highlighted the rest of the banquet program.

The second day of the meeting was primarily a schooling on how to handle noxious weeds.

At New England Fertilizer Conference

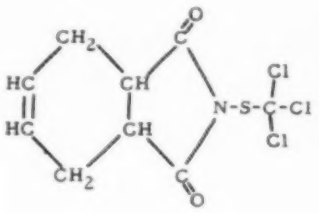


Top: Photo taken at the New England Fertilizer Conference, held at the Connecticut Agricultural Experiment Station, New Haven, February 27 and 28. Left to right: E. S. Russell, Director, National Fertilizer Association; F. S. Lodge, Assistant to the President, NFA; W. A. Meeker, Director, NFA; R. E. Fraser, Director, NFA; Dr. James G. Horsfall, Director, Connecticut Agricultural Experiment Station; B. B. Fall, Director, NFA; Dr. Russell Coleman, President, NFA; and Dr. C. L. W. Swanson, Head, Soil Department, CAES.

Lower photo: Speakers at the opening session of the Conference. Left to right: Dr. Horsfall; Dr. Firman E. Bear, Head, Soils Department, New Jersey Agricultural Experiment Station; Dr. T. E. Odland, Head, Agronomy Department, Rhode Island Agricultural Experiment Station; Dr. Vincent Sauchelli, Director of Research, Davison Chemical Corporation, Baltimore, Md.; and Ralph W. Donaldson, extension agronomist, University of Massachusetts. The conference celebrated jointly the 100th anniversary of the founding of the American Fertilizer Industry and the 75th anniversary of the Connecticut Station.

Esso Has New Fungicide

The chemical constitution of "SR-406," new synthetic organic fungicide developed by the Standard Oil Development Co. has just been made known by the company. It contains as the active component, the compound "N-trichloromethylthio-tetrahydrophthalimide" which has the following molecular structure:



As a fungicide, the material has proved effective against plant diseases ranging from apple scab in the eastern states to tomato and potato blights in Florida and diseases attacking banana and coffee in Central America. While showing activity against vegetable blights at least equal in most cases to that of presently available fungicides, the new material is of special interest because of high potency on fruits. The compound appears to be non-toxic to warm-blooded animals, based on preliminary toxicological testing. It is expected to be brought up before the current hearings of the Food and Drug Administration in Washington.

Following initial discovery by the Esso Laboratories, "SR-406" was tested in laboratory and greenhouse experiments as part of a broad cooperative program with Rutgers University. First outdoor field tests were made early several years ago in Florida at the Bradenton, Florida, Agricultural Station. Field testing has been conducted subsequently at the New Jersey and the Homestead, Florida, Experimental Stations, and in Belle Glade, Florida.

Manufacture and distribution of the fungicide in the United States will be handled by the California Spray-Chemical Corporation of Richmond, Cal., and Elizabeth, N. J., under a licensing arrangement.

Union Bag Ups Bradley

The appointment of Sydney K. Bradley as Director of Multiwall

SYDNEY K. BRADLEY

Bag Sales for Union Bag & Paper Corporation has been announced by Leonard J. Doyle, vice-president. Mr. Bradley joined the Union Bag organization in 1938, serving first as Director of Chain Store Sales, then as Eastern District Manager of Multiwall Bag Sales and most recently as Assistant Director of Multiwall Bag Sales.

During the war, Mr. Bradley held the rank of Lt. Colonel and served as a staff officer assigned to the Headquarters Army Service Forces in Washington, D. C.

•

Cotton Insect Control

Georgia Agricultural Experiment Station has issued the following recommendations for the control of cotton insects: a 3-5 mixture of BHC and DDT at 10 pounds per acre; calcium arsenate to be used in alternate applications with BHC-DDT at 7-10 pounds per acre, and/or toxaphene, 20 percent, applied at the rate of 10 pounds per acre.

Complete recommendations, including materials, method and time of application, and spray applications, are available from Press Bulletin #619, Georgia Experiment Station, Experiment, Ga.

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Offers New Emulsifier

Emulsol Corporation, Chicago, has recently marketed a new product, "Emcol H-77," a new emulsifier for DDT, toxaphene, chlordane, BHC, methoxychlor aldrin, dieldrin, 2,4-D and 2,4,5-T, as well as certain combinations of these toxicants. Descriptive literature is available. Ask for Technical Bulletin #29, Emulsol, Corp., 59 E. Madison St., Chicago 3, Ill.

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Dr. McIntosh to Conn.

Dr. A. H. McIntosh of the Rothamsted Agricultural Experiment Station, Harpenden, Herts., England, has joined the Entomology Department of the Connecticut Agricultural Experiment Station for a year's period. Dr. McIntosh is here under an exchange agreement between the two stations; next year a member of the staff of the Connecticut Station will work for six months at the English institution.

Dr. McIntosh has been a chemist in the Department of Insecticides at Rothamstead since 1944. While in New Haven, he will continue in his field of insecticide study.

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To Iowa For Spencer

Spencer Chemical Co., Kansas City, has announced the appointment of Alvin Bull to its Technical Services staff. Mr. Bull will serve as

ALVIN BULL

promotional agronomist in the state of Iowa, with headquarters at Ames. The new appointee is a graduate of Iowa State College, with a degree in agronomy. His new duties will include demonstrational and educational work throughout Iowa.

Fernald Asst. Export Mgr.

John Powell & Co., New York, has announced the appointment o

CHARLES P. FERNALD

Charles P. Fernald, formerly of the Verney Corporation, as assistant Export Manager in charge of Powell's international sales. Mr. Fernald's previous experience has been in this field. His appointment results from the company's expansion program in the export of agricultural chemicals.

•

N. J. Mosquito Meeting

The 37th annual meeting of the New Jersey Mosquito Extermination Association was held at Atlantic City March 1-3. Speakers included Hendrick Van Brederode, Midland Park, N. J., president of the Association; Dr. W. H. Martin, dean and director of the College of Agriculture and Experiment Station at Rutgers University, New Brunswick, N. J.;

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Fertilizer Ass'n Moves

The California Fertilizer Association announces that it has moved to a new location in Los Angeles, 4700 District Boulevard.

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Brussels Meeting Planned

Plans for the 8th International Congress for Agricultural Industries to be held in Brussels, Belgium, July 9-15, include a number of papers on pest control, fertilizers, and plant disease control chemicals, according to Dr. T. C. Helvey, Cornell University, Ithaca, N. Y., from whom full information is available.

APS Divisions to Meet

M. F. Kernkamp, University of Minnesota, St. Paul, secretary of the North Central Division of the American Phytopathological Society, has announced that the summer meetings of the Division will be held at Michigan State College, East Lansing, June 22-24. Details of the program had not been worked out at press time.

The Southern Division of the APS will hold a meeting December 1-3 at Memphis, Tennessee, according to James A. Lyle, Alabama Polytechnic Institute, Auburn, Ala., secretary-treasurer of the Southern Division. The December meeting will be held in conjunction with the annual meeting of the parent society, he said, explaining further that unless a divisional meeting is held in conjunction with the parent society, all Southern Division meetings are held as a section of the Association of Southern Agricultural Workers whenever that group has its annual meeting.

George A. Zentmyer, secretary-treasurer of the Pacific Division of the American Phytopathological Society has announced that the Division meeting will be held in Salt Lake City, Utah, June 21-23, inclusively. The program was nearing completion at press time, Dr. Zentmyer said.

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NSDA Adopts Emblem

A new emblem (below), has been adopted recently by the National Sprayer and Duster Association, Chicago. A spray or dust cloud emanating from a nozzle in a corner of the background provides a border.

Spencer Buys Army Plant

Acceptance of the $3,000,000 bid of Spencer Chemical Co., Kansas City, for the Ohio River Ordnance Works at Henderson, Ky., has been recommended by the U. S. Corps of Engineers. Affirmative action by the Secretary of the Army will make this huge fertilizer plant the property of Spencer. Improvements in the plant are contemplated. Spencer is also reported leasing Indiana Acid Area No. 2 as part of its expansion program.

•

J. A. Woods Heads CSC

J. Albert Woods has just been named president of Commercial Solvents Corp., New York, succeeding the late Henry E. Perry. In taking his new post, Mr. Woods resigns the presidency of Wilson & Toomer Fertilizer Co., Jacksonville. Mr. Woods was one of the founders of the American Plant Food Council. He was formerly vice-president of Armour Fertilizer Works, and president of Chilean Nitrate Sales Corp.

NAC Warns: "Buy Early"

With infestations of three major insect pests expected to exceed the intensity of 1949 outbreaks, the National Agricultural Chemicals Ass'n. has issued a number of bulletins urging farmers and growers to review their control programs, and place at least partial orders for anticipated needs. L. S. Hitchner, executive secretary of the NAC Association, says that while industry has geared production to meet the probable need, advance ordering will still be necessary if the demand is to be met fully.

The boll weevil, European corn borer, and grasshopper are the three major insects expected in greater numbers by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. Reasons for the anticipated heavy outbreaks are the mild winter over much of the country and the heavy population of the insects overwintering last season.

The Department also issued a specific warning in mid-April against "one of the greatest Green Bug infestations in modern agricultural history" under way in Texas, Oklahoma, New Mexico and Kansas. The infestation is extending into Southeastern Colorado and may spread later in the season, to Nebraska, the Dakotas, Minnesota and other northern areas.

If the weather continues cool and dry, the Department warned, most of the small grain acreage in these areas would shortly need insecticide treatment.

•

More Fertilizer Storage

A new addition recently completed at the Southwest Virginia Cooperative plant at Bristol, Va., will double the factory's storage space, it is reported. The new arrangement will allow the mixing of larger quantities of different grades of fertilizers and will permit them to cure properly in storage.

•

New Fertilizer Conveyor

A new type of portable screw feeder for metering out dry chemicals from original drum containers has been placed on the market by Gifford-Wood Co., Hudson, New York. Known as the "Chemical Feeder," the outfit consists of a four inch diameter screw conveyor driven by a half horse power variable speed motor. It is designed to operate at the rate of from 3 to 9 cubic feet per hour. Detailed information is available from the manufacturer.

•

"Fact Folder" Presented

U.S. Industrial Chemicals, Inc., New York, has issued a "Pyrenone Fact Folder" in the form of an envelope-file folder in which may be kept information on insecticidal products. Full information is given on the "Pyrenone" concentrates, with a table presenting product specifications for those most commonly used. In the envelope portion of the folder are extra sheets containing information on pest control for dairy, livestock, food processing, truck crops, and miscellaneous. Other data on household aerosols and on food handling are also presented. These folders may be obtained from the company, 60 E. 42nd St., New York 17, N. Y.

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MEETINGS

National Agricultural Chemicals Ass'n., Haddon Hall Hotel, Atlantic City, April 20 & 21.

Western Shade Tree Conference, Long Beach, Calif., May 24-27.

Chemical Specialties Manufacturers' Association, Drake Hotel, Chicago, Ill., June 12, 13.

The National Fertilizer Association Greenbrier Hotel, White Sulphur Springs, W. Va., June 12-14.

Pacific Slope Branch, A.A.E.E., Hotel Casa del Rey, Santa Cruz, Calif., June 14, 15 & 16, 1950.

Pacific Division, APS, Salt Lake City, Utah, June 21-23.

North Central Division, APS, Michigan State College, East Lansing, Mich., June 22-24.

American Plant Food Council, The Homestead, Hot Springs, Va., June 29-30, July 1 & 2.

National Shade Tree Conference, Syracuse, N. Y., Aug. 21-25.

California Fertilizer Association, Coronado Hotel, San Diego, Calif., November 2-4.

American Association of Economic Entomologists, Denver, Colorado, Dec. 18-21.

To A. & S. Board

SHELDON Y. CARNES

The Board of Directors of Arkell and Smiths has announced recently the election of Sheldon Y. Carnes to vice president and a member of the Board of Directors.

•

Potomac Div. APS Meets

The seventh annual meeting of the Potomac Division of the American Phytopathological Society was held March 9 & 10 at the U. S. Department of Agriculture Plant Industry Station, Beltsville, Md. More than a hundred persons were in attendance to hear discussions on plant diseases and their control. Dr. E. C. Stakman, past president of the American Association for the Advancement of Science, was speaker at the Thursday evening banquet. His subject: "Science in Human Affairs."

Chairmen of the various sessions included C. L. Lefebvre, L. O. Weaver, I. W. Tervet and J. W. Heuberger. Officers of the group are Dr. Lefebvre, president; C. E. Cox, vice-president; J. B. Damaree, secretary-treasurer and Paul R. Miller, Councilor. The committee in charge of the meeting was composed of H. A. Rodenhiser, chairman, Ross W. Davidson and H. T. Cook.

•

Vote on S.W. Branch AAEE

Members of the American Association of Economic Entomologists were voting this month whether to admit the Texas Entomological Society as the Southwestern Branch of the A.A.E.E. All votes were to be in the hands of Dr. E. N. Cory, College Park, Md., by April 30.

A&S MULTIWALLS *stand* UP *and* OUT!

RECENT DEVELOPMENTS FROM THE A&S PACKAGING LABORATORY

- **EXPENDABLE PALLETS**
  Palletized shipments of A&S bags lower your handling costs, minimize storage space.
- **STA-STAK BAG**
  Creped outer wall takes skid and slip out of stacking. Greater resiliency, easier handling.
- **SHUR-CLOSE**
  Ingenious bag valve assures less dust when packing — less sifting when packed — prevents waste.
- **PLASTO-PAK BAGS**
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- **SUPER GLOSS FLOUR BAG**
  Toughest of flour bags is bright white with brilliant inks to provide sparkling, appealing shelf packages.
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  Sharp, clear color process combines perfect reproduction and brightness for consumer packages.
- **HI-TONE PRINTING**
  Strong, deep colors for sugar, salt, rice and similar bags.
- **PRESSUR-PAK BALE**
  Bags are packed under pressure. Saves 50% of customers' space allotted to storage.

● A&S Multiwall bags *stand up* under all kinds of shipping and storing abuse, because every ply is made of No. 1 specification kraft, and every bag must pass the rigid A&S spot inspections.

A&S Multiwalls *stand out* because they are printed on modern 6-color presses that reproduce a bag design in eye-arresting colors unsurpassed in commercial bag printing. Why not have our A&S packaging specialists analyze your packages? These men know how to build impact into the flat exterior of what could otherwise be a dull and unimaginative package. This combination of unusual design and faultless printing is yours at no extra cost.

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To Judge Fertilizer Essays

The American Plant Food Council has announced the appointment of Knox T. Hutchinson, assistant secretary of Agriculture as chairman

KNOX T. HUTCHINSON

of the board of judges in a nation-wide essay contest sponsored by the APFC and the National Grange. Subject of the essay is "Soil Fertility and the Nation's Future."

Mr. Hutchinson succeeds Albert J. Loveland, who recently resigned as under-secretary of Agriculture. Clifton A. Woodrum, president of the American Plant Food Council, has announced the following list of judges in addition to Mr. Hutchinson: Dr. Hugh H. Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture; Miss Lois M. Clark, Assistant Director, Division of Rural Service, National Education Association; Dr. W. T. Spanton, Chief, Agricultural Education Service, U. S. Office of Education and Dr. M. L. Wilson, Director of Extension Work, USDA.

Mr. Hutchinson will present personally the awards to the six National winners at the 1950 Convention of the American Plant Food Council on Saturday, July 1.

•

MIFI Elects Officers

Max Smith, Millsburg, Mich. was elected president of the Michigan Insecticide and Fungicide Institute at the annual conference held at Michigan State College, East Lansing, recently. Other officers elected were: first vice-president, Earl Staubro, Wixom; second vice-president, Earl Steimle, Sodus; secretary, Clint Palmer, Lansing; and treasurer, Keith Landsburg Fennville. Hugh Roach, Fennville, was named a director of the Institute.

•

Kentucky Fertilizer Plant

A new fertilizer plant will be built at Viley Station, near Lexington, Kentucky, according to plans filed by J. R. Myers of that city and his son, R. H. Myers of Ashland, Ky. The main building will be 100 by 200 feet and will be erected at the intersection of Viley Pike and the L & N Railroad on a three-acre site. The new factory equipped will cost about $100,000 and will employ twenty persons.

•

Service Totals 104 Years

Two brothers, Frank M. and Arthur C. Ewer, have set a record of company service that is seldom equalled, each of them having been with Bemis Bro. Bag Co. for more than a half century. Both continue to be active in the management of the

FRANK

ARTHUR

company, despite their total of 104 years on the job. Frank Ewer of the Boston office is a vice-president and director; and Arthur Ewer is manager of the Bemis plant in Brooklyn, N. Y.

Both brothers joined the Bemis organization in the Boston office; Frank in November, 1896, and Arthur in February, 1900. Each has held responsible positions with the company in Boston, St. Louis and San Francisco.

Frank was elected assistant treasurer in 1918, treasurer and a director in 1921, and in 1940 became a vice-president. Arthur, now manager at Brooklyn, was appointed to his present position in 1935.

Downey to Toxaphene Sales

Hercules Powder Co. has appointed Norman R. Downey as a technical representative of the company's toxaphene service group. Mr. Downey

NORMAN R. DOWNEY

was formerly in the Hercules office at Birmingham, Alabama, as a sales serviceman for the explosives department. He is a native of Mississippi, and a graduate of the University of Tennessee, and has been with Hercules since 1942.

•

Soils Committee Meets

Forty-seven members of the Northeastern Soils Research Committee concluded a two-day session at the Connecticut Agricultural Experiment Station February 24 with election of officers for 1950. Dr. Richard Bradfield of the Cornell Agricultural Experiment Station was elected chairman of the committee for the next two years, succeeding Dr. Firman E. Bear, New Jersey Experiment Station, who presided at the meetings. Dr. R. Q. Parks of the Division of Soil Management and Irrigation, U. S. Department of Agriculture, was re-elected secretary.

Soil scientists attending the conferences heard reports from several sub-committees, covering their work of the past year. Some of the subjects under discussion were: pasture soils, phosphorous studies, supplemental irrigation, drainage, effects of herbicides and insecticides on soils and plant growth, and soil problems in production of potatoes and other intensively fertilized vegetable crops.

MGK to Market "264"

McLaughlin Gormley King Co., Minneapolis, announces that it has acquired U. S. Patent rights on the insecticide synergist "264" from Van Dyk & Co., Belleville, N. J. MGK will offer this synergist on the market for use in aerosol bombs and other insecticides.

The synergist has been under investigation for more than a year. New uses include combining it with both natural and synthetic insecticides. Particular effective use is said to be in fortifying allyl analog of cinerin I (allethrin) for the control of a number of pests, both household and agricultural.

•

McClure Honored in N. Y.

Dr. Harry B. McClure, vice-president, Carbide and Carbon Chemical Division of Union Carbide and Carbon Corporation, was presented the CCDA Honor Award at a meeting held March 22 in New York. The presentation was made by Charles D. Goodale, president of the Commercial Chemical Development Association, sponsor of the award, in recognition of the recent development of allethrin, the synthetic allyl homolog of Cinerin I.

•

Derris in New Location

Derris, Inc., suppliers of rotenone derris and cubé powder and oil concentrates, has moved its New York headquarters to 120 Wall Street from the old address at No. 79. The telephone number, HAnover 2-1580, will remain the same, the company states.

•

Lane Pennsalt P. R. Mgr.

Cleveland Lane has been named manager of the newly formed public relations division of Pennsylvania Salt Manufacturing Co., Philadelphia.

Fungicides Discussed at 117th ACS Meet

THE 117th National meeting of the American Chemical Society was held in Philadelphia during the week og April 10. A number of talks on fungicides were included in the program. On Wednesday, April 12, a symposium on the newer fungicides was held under the subdivision of Economic Poisons, with Dr. J. L. St. John, Washington State College, Pullman, Wash., as chairman and L. G. Cox secretary.

Dr. R. H. Wellman, Union Carbide & Carbon Corp., New York, introduced the general subject, stressing the economics of fungicides and their use. He was followed by Dr. S. E. A. McCallan, Boyce Thompson Institute for Plant Research, Yonkers, N. Y., who was to describe the testing techniques devised for measuring the performance and toxic properties of various compounds.

Among the papers to be presented were the following: "Derivatives of Dithiocarbamic Acid as Fungicides," by Wendell H. Tisdale and Albert L. Flenner, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.; "Fungitoxicity of Heterocyclic Nitrogen Compounds," by Dr. James G. Horsfall, director of the Connecticut Agricultural Experiment Station, New Haven; "Phenolic Fungicides in Agriculture and Industry," by R. H. Gruenhagen, Paul A. Wolf and Edwin E. Dunn, all of Dow Chemical Co., Midland, Mich.

Dr. George L. McNew, director, Boyce Thompson Institute, and Harry P. Burchfield, Naugatuck Division of U. S. Rubber Co., Naugatuck, Conn., were authors of a paper on "The Relationship of Chemical Structure and Physical Properties to the Fungitoxicity of Quinones"; and Fred R. Whaley, Linde Air Products Co., Tonawanda, N. Y. and John B. Harry, Union Carbide & Carbon Corp., New York, discussed the "Chromate Complexes as Fungicides."

The section on fertilizer was not scheduled to meet at these sessions, nor were topics on insecticides listed on the program. The Philadelphia headquarters were in the Hotel Bellevue Stratford.

Air Meeting Summarized

A summary booklet of the aerial spray conference held at Manhattan, Kansas Nov. 30 through December 2, has been published by the four sponsoring groups: Kansas Flight Operators Association; K.I.D.C. Division of Aeronautics; State Board of Agriculture; and Kansas State College. The booklet is a transcript of the conference, with complete papers covering the topics discussed. Among these are "Application of Fertilizers and Seed by Airplane," by Dr. H. E. Myers, Dept. of Agronomy, Kansas State College; "How 2,4-D Kills," by Dr. J. C. Frazier, Dept. of Botany, Kansas State College; "Control of Weeds in Wheat," by Wm. Phillips, U.S.D.A., Hayes, Kansas; "The National Picture in Aerial Spraying for Weed Control in 1949," by Dr. L. M. Stahler, U.S.D.A., Brookings, S. D.; "Summary of 1949 Results and Recommendations for 1950," by Prof. J. W. Zahnley, Kansas State College; "Dangers Connected with the use of 2,4-D," by G. L. McCall, E. I. duPont de Nemours & Co., Kansas State College; "Toxicology & Residue Problems of Insecticides in Relation to Airplane Application," by Paul A. Dahm, Dept. of Entomology, Kansas State College; "The Status of Controlling Field Crop Pests by Airplane," by Dr. George C. Decker, Illinois Natural History Survey, Urbana, Ill.; and "Aerial Spray Equipment Problems," by Don E. Pratt.

•

CSC Publishes History

Commercial Solvents Corp., New York, has recently issued a booklet picturing its research activities from 1925 up to the present time. A complete history of the company's development over the years is presented, with numerous photographs and charts to illustrate. The company's offices are at 17 E. 42nd St., New York 17.

•

Michigan Chemical Report

Michigan Chemical Corp., Saint Louis, Mich., has issued its annual report for 1949, with a considerable portion of the report set aside for discussion of its activities in the agricultural chemicals field.

Pennsalt Appoints Ash

The appointment of Alvin C. Ash as technical sales service representative has been announced by the Washington Agricultural Chemicals division of Pennsylvania Salt Mfg. Co., Philadelphia. Mr. Ash will have headquarters at the company's plant in Tacoma, Wash., working with W. J. F. Francis, sales manager and Errol H. Karr, technical supervisor in that area. During the 1950 season, he will engage in the formulation and testing of new materials and in sales service work in connection with the use of the company's line of chemical products for agriculture.

ALVIN C. ASH

•

Fertilizer Plant Damaged

Jackson Fertilizer Works, Jackson, Miss., suffered heavy damage in the recent windstorms which swept areas of the south. More than 33 tons of sulfuric acid were destroyed in the fertilizer plant when the wind and falling timbers tipped over five head vats.

•

New Lindane Plant

Commercial Solvents Corp. plans to erect a new insecticide plant for the large-scale production of lindane at Terre Haute, Ind. The new unit will be located adjacent to the company's present BHC plant and will utilize the latter's production of technical-grade material for the extraction of the gamma isomer.

Expansion plans include an estimated 25 percent increase in the present plant which will permit the continued marketing of the technical product in addition to supplying material for the new plant. Cost of the projects is estimated at about $500,000.

About six months will be required for expansion of the present BHC plant, while the large-scale production of lindane may be under way in about a year.

Canadians Use Aldrin

The Canadian Department of Agriculture has announced that it will use aldrin (formerly "Compound 118") for control of grasshoppers in the provinces of Alberta, Manitoba and Saskatchewan, where large acreages of wheat and other grains are raised. The Department has indicated that from 2 to 4 ounces of aldrin per acre will be used in spray or dust for control of the 'hoppers.

CPR controls these insects

BEANS
- Mexican bean beetle
- Onion thrips
- Corn ear worm
- Bean leaf beetle

CURCUBITS
- Melon worm
- Pickle worm
- Squash vine borer

CRUCIFEROUS CROPS
- Imported cabbage worm
- Diamond back moth
- Cabbage loopers

PEAS
- Pea weevil
- Omnivorous leaf tier
- Pea aphid

CELERY
- Lygus campestris
- Celery leaf tier

ASPARAGUS
- Asparagus beetle

TOMATOES
- Flea beetle
- Colorado potato beetle
- Blister beetle
- Potato aphid

POTATOES
- Colorado potato beetle
- Blister beetle
- Flea beetle

BEETS
- Webworm

LETTUCE
- Corn ear worm

SPINACH
- Leaf tier

BLUEBERRIES
- Blueberry fruit fly

ORNAMENTAL PLANTS
- Box elder bug

In addition to CPR's unusually wide range of control [illegible] has these advantages —

• No toxic residues — Crops can be treated right up to and during harvest . . . forage treated with CPR can safely be fed to livestock.

• Fast-killing — Insects stop feeding within a few hours after application. Rainfall within 4 to 6 hours after application doesn't necessitate immediate reapplication to control active stages of the insects.

• Long-lasting — CPR has good residual effectiveness, resistance to weathering, and persistence on foliage. It lasts up to twice as long as a straight rotenone dust.

For complete information about the formulation of dusts or sprays based on CPR — or about their use and where to buy them — write us today.

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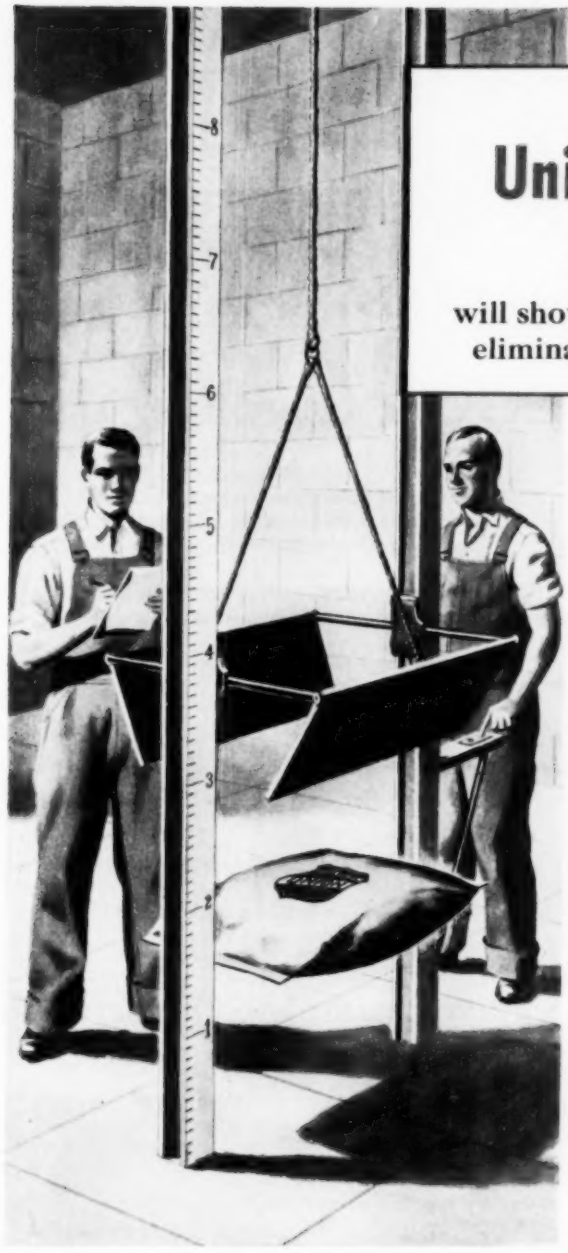

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Continuous testing in Union laboratories leaves nothing to chance. Bag paper is tortured and torn, burst and frayed. Loaded bags are dropped and tumbled and scuffed to discover any weak points, any need for strengthening.

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This constant checking and testing is a safeguard for every order of Union Multiwall Bags. So when your Union Multiwall representative calls on you, tell him the requirements of your product, its shipping and handling. You can be sure your delivered bags will live up to specifications.

Even if you are now using multiwall bags, your Union representative can give you new ideas on bag construction, packaging and handling that will save you money. So welcome him when he calls!

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Empties Clean

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Add **SELECTIVITY**

to your insecticide

with **ALCOA** Cryolite

ALCOA Cryolite has *high* killing power—but it is also SELECTIVE! It kills insects harmful to many crops, but has no appreciable effect on bees and other *beneficial* insects. It does not kill birds or other wild life.

ALCOA Cryolite is a standard, high-power insecticide, approved by state experiment stations. Its properties are *dependable* and universally well-known.

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- **Free dusting . . . free spraying**
- **High suspendability in spray tank**
- **Negligible abrasive effect on equipment**
- **Does not affect soil balance**
- **Safe on delicate foliage**
- **Wets and mixes readily**
- **Has good adhesion**
- **Active ingredient—90%**
- **Compatible with insoluble-type copper compounds, sulphur and other neutral fungicides, insecticides and diluents.**

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NIAGARA CHEMICAL DIVISION
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For further information write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 641 Gulf Building, Pittsburgh 19, Pa.

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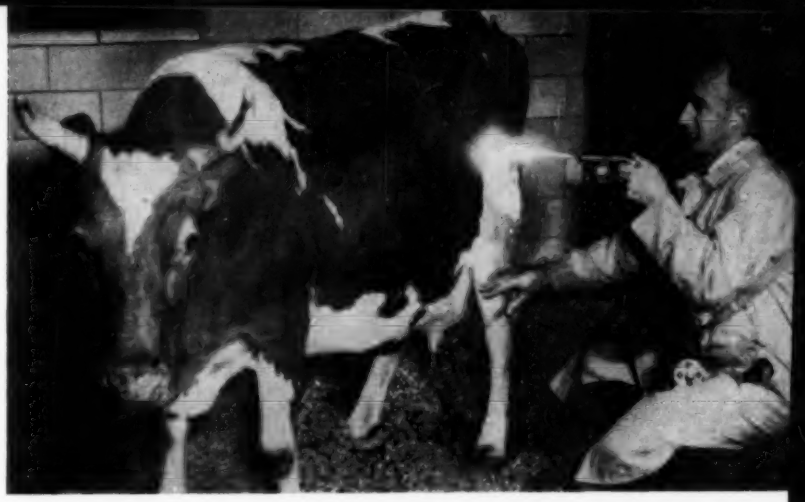
"ALLETHRIN" in commercial production by U.C.C.



Allethrin for dairy sprays is expected to be an important use of the new material. Toxicity hazards are regarded as being minimum for this application.

ANNOUNCEMENT of the coined name "allethrin" to designate the allyl homolog of Cinerin I, or "synthetic pyrethrum," was made at Boyce Thompson Institute for Plant Research, Yonkers, N. Y., before a group of representatives of the press and the industry on March 16. The event, sponsored jointly by the Institute and by the Carbide & Carbon Chemicals Division of Union Carbide and Carbon Corporation, New York, marked the beginning of manufacture of this new insecticide raw material in commercial quantities by U.C.C., following intensive study during the past year by the research staffs of the two.

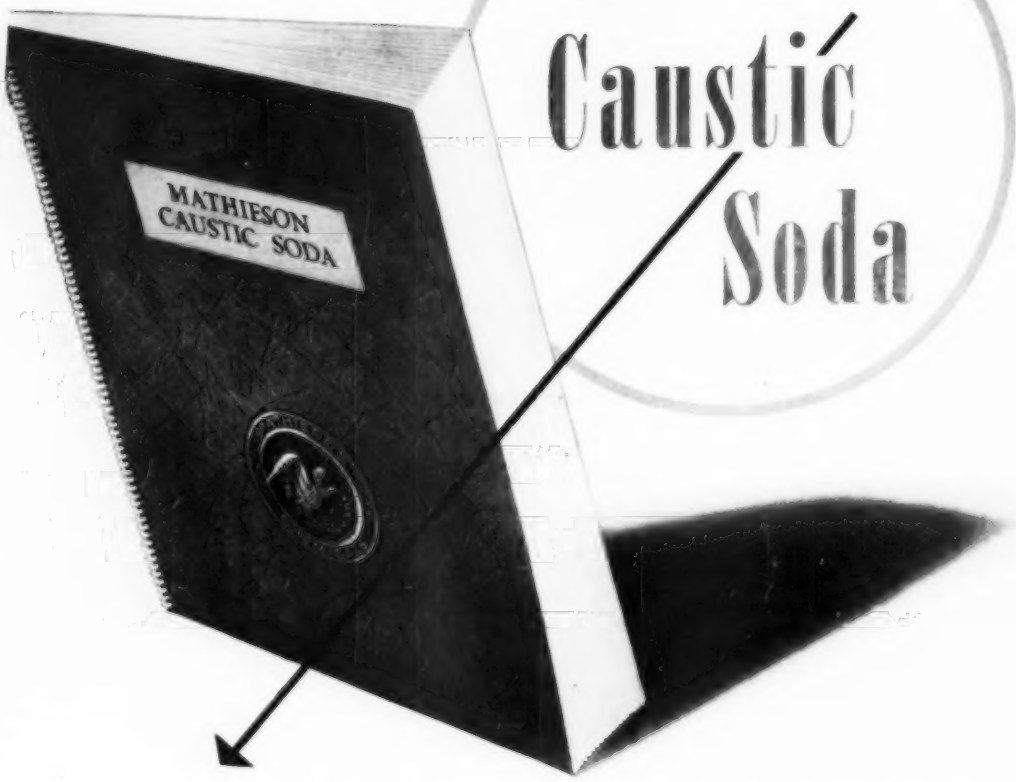
H. B. McClure, vice-president of the Carbide & Carbon Chemicals Division, described the steps which have led up to commercial production, stating that a multi-ton lot of allethrin had just been completed by his firm. In recounting some of the problems involved in the 12-step process, he stated that a million pounds of chemical solids and liquids, including water, had to be handled for each 5,000 pounds of finished material.

S. A. Kohwer, assistant chief, Bureau of Entomology & Plant Quarantine, U.S.D.A., Washington, told the group that the chemistry of pyrethrum has been investigated more extensively than any other natural product containing insecticidal constituents, and that widespread interest was shown when it was announced a year ago that a small amount of the material had been synthesized successfully. He congratulated the industry for its advancement beyond this initial step, and stated that since confusion may arise from the lack of a suitable name, the term allethrin has been selected to designate the material. Steps have been taken, he said, to preempt the name in the U. S. Patent Office.

The first commercial synthesis of allethrin was described by Dr. R. W. McNamee, assistant superintendent of research and development at the U. C. C. plant at South Charleston, W. Va. He reiterated the complexity of the process, stating that some 200 pounds of about 25 different chemicals must be handled to produce a single pound of the finished material.

Dr. George L. McNew, Managing Director, Boyce Thompson Institute, welcomed the group in a

for users of Caustic Soda



• This completely new 48-page book entitled "Mathieson Caustic Soda" is now available to users throughout industry. Fully illustrated, it covers in detail the manufacture, economics, properties, handling and sampling of this product.

In 1923, Mathieson was the first to make regular shipments of caustic soda in liquid form. Today, because of the expanded productive capacities of its three large plants at Saltville, Va., Lake Charles, La., and Niagara Falls, N. Y., Mathieson is recognized as one of the leading suppliers of liquid caustic soda.

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brief summary of work being done at the institute. He reviewed the history of the institute, stating that its objectives add up to the production of more food for the increasing population. Much of this must be accomplished through the wise use of agricultural chemicals, he said.

A demonstration of the action of allethrin compared with pyrethrum against flies and roaches, revealed the two products to be practically identical in both knock-down and kill. Dr. R. H. Wellman, Boyce Thompson Institute, discussed the properties of the two products, illustrating with latern slides the almost exact records of each in tests on various insects.

A panel of experts answered questions regarding allethrin to complete the program. The panel included Dr. Wellman as chairman; Dr. H. L. Haller, assistant chief, B.E.P.Q., U.S.D.A., Washington, D. C.; Dr. F. B. LaForge and M. S. Schechter, U.S.D.A. chemists who are credited with the first successful synthesis of pyrethrins; Dr. H. F. Smythe, Jr., Mellon Institute of Industrial Research, Pittsburgh, Pa., Dr. B. B. Pepper, chairman, Department of Entomology, Rutgers University, New Brunswick, N. J.; Harold Noble, vice-president, S. B. Penick & Co., New York; Dr. P. Grannett, associate research specialist in entomology, Rutgers University; and Dr. Donald F. Starr, S. B. Penick & Co.

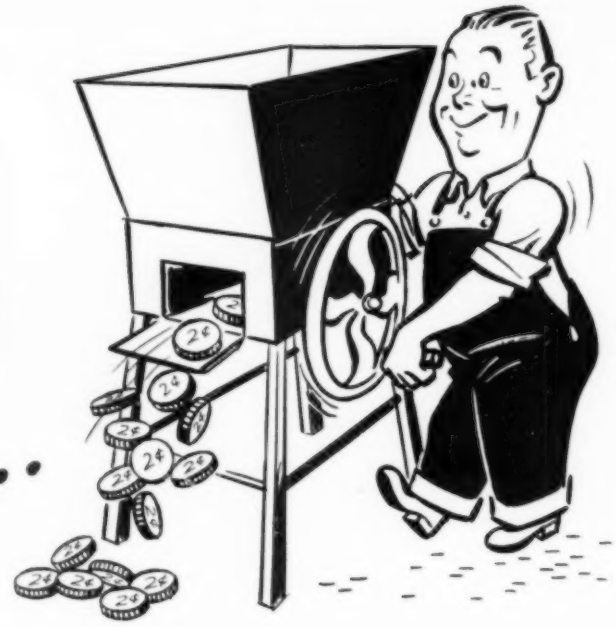
The bulk of questions asked were concerned with the toxicity of the new product, which was explained as being almost identical with that of natural pyrethrum from rather extensive tests made thus far. However, as Dr. Smythe pointed out, the toxicity curve may be altered considerably by the addition of solvents, synergists, etc. He warned that formulators must be careful on this score. Dr. Starr reported on experiments with rats, stating that after feeding tests of 30 weeks with adult rodents, normal litters of baby rats were born, and that contacts of allethrin with the skin of the young ones brought no ill effects.

Regarding the price structure, it was stated that the new product might follow the pattern of DDT which was reduced in price as quantities manufactured became larger, the economies of mass production being reflected promptly in reduced quotations. Dr. Rohwer stated that at present, only shipments of concentrated allethrin are permitted in interstate commerce, not the formulated products. However, there are likely to be products containing allethrin on the market soon, he said, . . . except in aerosol form. More study of inhalation hazards must be made before aerosols may be safely passed for use, Dr. Rohwer pointed out.

Dr. Haller observed that more synthetic products are almost bound to come out of the research now being done, and that so far "the surface has only been scratched" in the development of new insecticides. He commended industry for doing so well in working out many of the problems which confront science in the control of insects.

Although production of the

Reduced Grinding Costs...



...part of the 2¢ per pound you save by using CELITE* in your primary grinds

Reduced grinding costs . . . reduced packaging costs . . . reduced storage and shipping costs—these are some of the savings you can make by using Celite 400 as a primary grinding agent . . . savings that may amount to as much as 2¢ per pound on every pound of toxicant you grind.

Here's how Celite 400 can help you save:

Reduced grinding costs: Because of Celite's higher liquid absorption properties (more than twice its weight of water), you can grind up to 70% DDT mixtures. High concentrates of BHC and other low melting point poisons may also be ground with Celite.

Reduced packaging costs: The higher strength primary grinds made possible by the use of Celite 400 enables the packaging of more toxicant per unit package.

Reduced storage and shipping costs: These highly concentrated primary grinds produced by the use of Celite 400 ship and store more economically.

TYPICAL CELITE 400 PROPERTIES

Fineness: 8% maximum on 325 mesh
Density (Vibrated): 12.5 pounds per cubic foot
Bulk: Celite bulks much higher than most diluents
Absorption: 215% of its weight of water
300% of its weight of kerosene
pH Value: Below 7.0
Inertness: Compatible with insecticide and fungicide poisons
Suspension: Excellent in both air and water
Composition: Celite is amorphous diatomaceous silica (SiO_2)

For further information about Celite 400 write Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

Johns-Manville CELITE 400

new material is to be handled entirely by U. C. C., sales will be made through three well-known firms already established in the field. These are S. B. Penick & Co., New York; John Powell & Co., Inc., New York; and McLaughlin Gormley King Co., Minneapolis, Minn.

U. S. Industrial Chemicals, Inc., New York, have purchased foreign patent rights on allethrin and will market the material abroad.

•

Montana Fertilizer Report

Montana State College and Agricultural Experiment Station, Bozeman, has recently issued Bulletin No. 469, "Commercial Fertilizer Report for 1949." Information contained in the booklet consists of a copy of the state fertilizer law and a report of the state chemist on tests during the year.

•

Lime Production in Ark.

Operation of the new White River Limestone Products Company at Penter's Bluff, 16 miles west of Batesville, Ark., on White River, will begin early this summer. The $300,000 plant will have a daily production capacity of 2,000 tons of chemical limestone for industrial use, aggregate for road building and concrete work, and agricultural limestone. It will be operated by an Arkansas corporation of which Howard Moore of Little Rock is president. Agricultural experts have estimated that 500,000 tons of agricultural limestone are needed in pasture areas of the state alone each year.

•

Opens Fertilizer Plant

The opening of a new plant in Nashville, Georgia, has been announced by Claude H. Walker, president of the Walker Fertilizer Co., Inc., Orlando, Fla. Mr. Walker states that the company will manufacture fungicides and insecticides in the new plant, and will carry a complete line of dusts and sprays for the trade. It was pointed out that there is a definite demand for this type of plant to service growers throughout the eastern half of the states. J. J. Rutherford is sales manager of the firm, and H. B. Hunt, plant manger. A minimum of 20 persons are expected to be employed in the new enterprise.

•

NESWCC Summarizes Meet

A supplement to the proceedings of the Northeastern States Weed Control Conference has been published recently by that group. It contains the full text of papers and addresses presented at the January meeting held at the New Yorker Hotel, New York. Also included is the complete registration list and names of companies having exhibits at the conference. New Officers named at the conference were: Dr. H. L. Yowell, Esso Standard Oil Laboratories, Elizabeth, N. J., president; Dr. S. M. Raleigh, Pennsylvania State College, State College, Pa., vice-president; and Dr. Walter C. Jacob Cornell University, Ithaca, N. Y., secretary.

If you handle

PARATHION

you need the

New WILLSON AGRISOL RESPIRATOR

Exploded view of Agrisol Respirator. Filter disc held securely against exposed side of cartridge by threaded retaining ring.

Containing both dust-filtering discs and vapor-absorbing cartridges, this new Agrisol Respirator may be used in open field spraying and dusting.

This unit was developed by Willson's Industrial Hygiene Laboratory which specializes in the development of protection against industrial dust, mist and vapor hazards. It is recommended wherever low concentrations of Parathion or other highly toxic insecticides might be used as wettable powders or sprays.

The Agrisol Respirator is now available for distribution. For further information write direct.

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Des Moines Register & Tribune

Control Corn Borer with LIQUID NIATOX 33

Other Niagara DDT formulations for corn-borer control...

NIATOX 10 DUST

NIATOX 5 DUST

NIATOX 50 WETTABLE POWDER

Corn is basic to our high standard of living. Niagara quality-controlled DDT formulations for corn-borer control are helping to protect this vital crop.

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fmc

Dr. Thomas to Int. Min.

Dr. R. P. Thomas, professor of soils at the University of Maryland, College Park, has been appointed market survey specialist for the plant food division of International Minerals & Chemical Corporation, according to a recent announcement by Louis Ware, president.

Dr. Thomas is on six months leave of absence from the university. He is a graduate of the University of Illinois and received his advanced degrees after study at the University of Iowa and the Univ. of Wisconsin.

•

Fertilizer Mfgr. Dies

John Griffin, Sr., 50, partner in the Griffin Fertilizer Co., Butler, Ky. died March 8 at the home of his son with whom he had been in business for the past year.

•

Ark. Group Elects

Newly elected officers of the Arkansas Pest Control Association are J. Heflin of Little Rock, president; Ernest Murrell of Little Rock, vice president, and Carl Whitson of Little Rock, secretary-treasurer. Daglin Foster of Pine Bluff has been elected to a one-year term as director and E. Wall of Blytheville to a two-year term as director. The organization was to meet at the Hotel Marion in Little Rock April 15.

•

Beg Your Pardon

An incorrect statement was attributed to Dr. Vincent Sauchelli in the March issue of *Agricultural Chemicals*, in connection with the report of the New England Fertilizer Conference. The story indicated that he had said that overborated plants, if fed to animals, may prove fatal to them. The correct statement should have read: "Boron, for example, can be tolerated in relatively large quantities by certain crops—alfalfa—but only in trace amounts by others—beans. An element such as molybdenum may be tolerated in large amounts by the plant, but such plants having a comparatively high content of the element may prove lethal to grazing livestock."

We regret this error and express our apologies to Dr. Sauchelli.

CSMA to Chicago in June

The Chemical Specialties Manufacturers Association (formerly NAIDM) will hold its annual meeting at the Drake Hotel, Chicago, June 12 and 13, it has been announced by H. W. Hamilton, CSMA secretary, New York.

FDA HEARING

(*Continued from Page 51*)

suffered by the shipper of perishable vegetables if regulations were issued which could not be checked and enforced prior to shipment. Other Florida growers who testified concerning their spray schedules were Louis B. Fisher, George H. Cooper, Henry J. Thurston, Fred R. Brown, and Robert Y. Creech.

Calif. Speaks Too

DR. SIDNEY HOOS, University of California, presented details regarding the economics of California fruit and vegetable production, to open testimony from his state. J. R. Lafolette, California Fruit Growers Exchange, discussed the insect pests and diseases that require control in the production of California citrus.

Dr. A. M. Boyce, University of California, and the Agricultural Experiment Station, presented extensive testimony relating to the use of insecticides and fungicides in the production of citrus and other fruits and vegetables in California. Dr. Boyce explained many of the angles of pest control, particularly the rapidity with which various insects develop resistance.

W. E. Baier, California Fruit Growers Exchange, discussed residue data on citrus. Mr. Baier also proposed that the F.D.A. establish tolerances on the basis of non-aqueous content.

Dr. Ralph Waldo Cummings, North Carolina Agricultural Experiment Station, was the first of the witnesses from his state. He cited the variance in climatic conditions in North Carolina and the resulting diversity of pest control problems.

Dr. Clyde F. Smith, North Carolina Experiment Station, discussed the use of insecticides in the production of fruit of various types, and Dr. Carlyle N. Clayton, also of the Station, testified concerning fruit diseases in North Carolina. Dr. Paul O. Ritcher, discussed the insects affecting vegetable crops in North Carolina. Dr. D. E. Ellis, presented testimony relating to vegetable diseases.

Ray Hutson, Michigan State College, was the first of the witnesses from the State of Michigan. He discussed both the insect pests and diseases of fruit and vegetables in his state, and presented as exhibits the spray schedules of Ohio and Indiana. Donald Cation, Michigan State College, talked on the use of fungicides in the production of fruit in Michigan. Dr. Erwin J. Benne, Michigan Agricultural Experiment Station, testified concerning the residues of lead arsenate, DDT, parathion, and BHC on various fruits and vegetables.

Dr. Milton Dyer Farrar, Clemson Agricultural College, dis-

cussed the use of insecticides and fungicides in the production of both fruits and vegetables in South Carolina.

Dr. Carlton F. Taylor, West Virginia Agricultural Experiment Station, discussed fruit and vegetable production and the various chemicals used in the control of insects and plant diseases in his area.

Daniel M. Dalrymple, a grower and secretary of the New York State Horticultural Society, described the hardships imposed upon the growers by past spray residue tolerances. Although these growers still suffer economically from these hardships, they are still in an excellent position to handle insect and plant disease problems. The growers are concerned that they may not be permitted to use certain marterials and feel that the tolerances established should be flexible enough to permit meeting unusual conditions, he said.

The testimony of Dr. Ralph L. Parker, Kansas State College, related primarily to control of codling moth on apples. Dr. Parker pointed out that no single insecticide has the ability to control all insects.

Dr. T. C. Allen, University of Wisconsin, discussed the various insect pests affecting vegetables and the insecticides used for their control. Dr. R. Keith Chapman, also of the University of Wisconsin, presented testimony related to various insect pests and diseases of sundry fruits and vegetables.

Dr. George C. Decker, Illinois Natural History Survey and University of Illinois, discussed the control of grasshoppers, ground insects and the insect pests of sweet corn. Dr. Decker stressed the public responsibility of the entomologist and the need for a wide selection of materials from which to choose.

Robert R. Walton, Oklahoma Experiment Station, testified concerning the insects which infest leafy and cruciferous vegetables and the experimental work which they have done on the various insecticides used in the control of these insects.

Mr. Walton was followed by three vegetable growers, Mike Meyer, of Arkansas, and Lee H. Tyler and Kenneth L. Stone, of Oklahoma. These growers outlined the insect problems with which they are faced in the production of leafy vegetables. Mr. Stone testified that, after having a crop of mustard greens rejected by a canner because of a custom sprayer had used an insecticide too close to harvest, he had quit using insecticides rather than run the risk of repeated rejections. He stressed the necessity of tolerances which will assure the grower the right to obtain adequate insect protection without this risk of rejection.

Present indications are that Part A of the hearing relating to necessity of use and residues should be completed by about the end of May. Under present plans, this would be followed by testimony by the Food and Drug Administration for the purpose of clarifying the FDA's tentative conclusions on hazards involved from the use of various chemicals. This

phase will not go deeply into the question of toxicity. Its primary purpose will be to eliminate as far as possible, certain chemicals from the necessity of further consideration. This will be followed by testimony on the consumption of the various fresh fruits and vegetables.

Following this testimony, it is anticipated that the hearing will be adjourned for approximately a month or six weeks, at the end of which time testimony will begin on the toxicity of those chemicals which have not been eliminated from further consideration.

FERTILIZER REPLIES

(*Continued from Page 43*)

up mixtures they have used with good results season after season and to accept new and more concentrated fertilizers that cost more per ton. Often too, distributing machinery in use has been found to be unsuited to the application of smaller amounts of concentrated mixtures and difficult to adjust to such changed needs. Thus, so simple and so obviously beneficial a change as the one made a number of years ago from 4-8-4 to 5-10-5 was slow of acceptance by many farmers.

"The acceptance of highly concentrated fertilizers has been further slowed down by the fact that they have not always given as good results in terms of crop production as did the less concentrated mixtures they replaced. These unfavorable results have been especially noticeable on the lighter colored, more sandy and less well limed soils and appear to have been due largely to the fact that the more concentrated fertilizers were necessarily made from highly concentrated materials and were generally deficient in the plant nutrients other than nitrogen, phosphoric acid and potash needed for good crop production and were strongly acid-forming.

"The solution of this problem lies not in irresponsible criticism of the fertilizer industry, but in cooperation with it in an effective program to carry to the farmer the true story of the benefits and limitations of fertilizer concentration so that he may wisely choose the program that gives to him the greatest return for each dollar invested. After all is said and done, this is the real goal and not concentration for its own sake, as some have seemed to think."

Farmer Resistance

THAT farmer resistance to the introduction of higher analysis fertilizer mixtures is often a very important factor is echoed by a Georgia manufacturer, who reports: "much farmer resistance has been encountered to the effort to increase fertilizer plant-food content. Farmers, having learned that certain grades of fertilizer produce good results, are often reluctant to switch to different grades which not only may be unknown to them, but also sell at higher prices per ton. When State agricultural experiment stations make recommendations of certain grades of fertilizer for certain crops, the industry's attitude has been, and is, to supply

those grades to farmers who would buy them. But acceptance of recommended grades, where there is no authority for state officials to ban the manufacture of other grades, is bound to be a matter of education, and the process will not always move along as rapidly as might be desired. Substantial prograss has been made . . .and progress will continue, in all likelihood at an accelerated pace, as educational material is increased in volume and becomes more readily available."

Potash Industry View

THE comments of an executive connected with one of the leading potash suppliers are confined to the sections of the F.T.C. report dealing with potash supplies. He calls attention to the fact that in assembling its record the Trade Commission has chosen for some reason to ignore the report on the potash industry prepared by the U. S. Department of Commerce, and published by the Department, May 1, 1940, under the authorship of Willard L. Thorp and Ernest A. Tupper. The Department's report was issued following a six-month study, and contained the following conclusion:

"The elaborate studies of the operating records of the four companies have covered customers, invoices, shipments, stocks, financial statements, price records, freight experience, as well as a mass of other data submitted by the companies in response to specific requests from the government. The picture is one of amazing growth from the days when the industry was monopolized by an international cartel. Overcoming difficult technical and financial obstacles, there have appeared three strong domestic companies, and a fourth is about to enter the field. Furthermore, the War has destroyed the unity of the international cartel, at least temporarily. The use of potash has increased markedly and the price level is 34 percent below that of 1910-1914, and 24 percent below the pre-depression level.

"It should be noted that this report has been formulated in economic rather than legal terms of reference. No effort has been made to determine whether the conditions discussed above, where modifications of present practices were suggested, are or are not in violation of the anti-trust laws. On the other hand, this study has not revealed any circumstances which establish the proposition that the laws have been violated. On the contrary, it appears that the potash industry has demonstrated clearly those factors of pioneering development, technological advance, and responsible management which represent the highest expression of American industry."

Says this potash company official, "I think this Department of Commerce report answers the F.T.C. adequately. . . . I am content to rest the potash case on the testimony contained in the Department of Commerce report.

"Since 1940, the domestic potash industry has expanded its production capacity nearly 400%, giving American agriculture a source of supply completely independent of imported material, despite the tremendous growth in demand during these years. Furthermore, this tremendous growth in domestic production was provided largely during the war years under ever increasing costs—applicable to every single item that enters into the cost of providing such facilities—without a single penny increase in the price of potash since 1937. In fact, shortly after O.P.A. controls were lifted, the price of potash was reduced approximately 11% at the Carlsbad, New Mexico production

point. . . . This reduction in price, together with the elimination of the port basing price system represents the only change in marketing methods employed today in the industry as compared with those covered by the Thrope-Tupper report.

"I challenge the F.T.C. to mention any single industry in the U.S.A. which has performed with a better record of accomplishment, and from any angle, than has the domestic potash industry."

"Old Stuff," He Says

THAT the FTC charges are "old stuff" was reiterated by a Maryland company spokesman who added that such charges have been ably refuted by the industry in the past. The plant food content of fertilizers has been the target for years for bombast from those who oppose "filler," he said. Many of these people had and still have a mistaken idea of what constitutes filler. "Some persons actually think that a mixture containing 20 percent plant food carries 80 percent filler, whereas such a grade will have only about 10 to 12 percent real filler, the rest of the make-up being sources of so-called secondary and minor elements," he declared.

"High analysis fertilizers considered by themselves have no special virtue," this Maryland manufacturer observes. "In fact," he continues, "they may have serious drawbacks. For instance, as mixtures become more and more concentrated, smaller percentages of other elements such as lime, magnesia and sulfur are present. Although these nutrients are classified as of secondary or minor importance, they assume great importance under certain soil conditions. In some areas of the southeast, for instance, there would be but little advantage for a farmer to change to a high-analysis fertilizer unless provision is made to have these minor elements added, since they are essential in local crop production. But the addition will cost money and can easily nullify the advantages derived from use of the higher grades."

The problem of application of concentrated fertilizers was also listed as another drawback to any sudden switch to higher-analysis products. "The tendency everyhere is to apply the high grade fertilizers at the same rate per acre as the lower grades," he explains. (Apparently there is an educational job to be done before we can count on high analysis fertilizers being used most efficiently. — *The Editor*)

A similar line of thought is expressed by a Pennsylvania manufacturer who takes issue with the FTC's assertions that a much higher concentration of fertilizer is desirable. He states that "the types of fertilizers made today use compounds as they are found in nature. They also permit the use of considerable amounts of organic matter. In this way the fertilizer does contain a very definite amount of trace minerals and other elements which are conducive to growing crops high in nutrient and vitamin values. . . . In higher concentrations, you take out of these compounds the elements which are vital to plant growth but are not necessarily required in an NPK guarantee. They also become

highly caustic and hard to handle.

"For this reason we do not advocate the manufacture of high analysis fertilizers similar to those mentioned, and feel that the FTC is absolutely wrong and is preaching a false economy in advocating this type of fertilizer."

From a prominent fertilizer manufacturing firm in New Jersey come additional arguments against the immediate switch to high-analysis fertilizers. "The subject . . . is a matter for education of the manufacturer, farmer and machinery manufacturer," he avers. "It should be left to the fertilizer industry and the various state agricultural experiment stations throughout the country, and certainly there is no more need for any government agency to interfere in the fertilizer industry than there is in the automobile, shoe, or clothing industries; and up to now they have never managed any industry as economically as has been done with private capital."

"There is a great difference between figuring things out on paper, theoretically, and making a practical application," this spokesman reminds. "The only income the farmer has is what he makes from the farm, and if he uses the wrong fertilizer he may not have any profit. Few farmers have used high analysis fertilizer, because they do not have the proper equipment to apply it, and they do not feel that now is the time to buy a lot of new expensive machinery when farm produce is declining in price."

"There is also the question of yields . . . high analysis fertilizers have not always worked out as well practically as they have theoretically, due to improper application and injury to plants through the lack of one or more of the minor elements which the farmer gets in the proper proportion in regular fertilizer. Such minor elements may not be contained in high-analysis mixtures, or may not be in the proper amounts," he points out.

"Psychologically, the average farmer is not too interested in any material that is questionable in any way, particularly when the unit cost is going to be nearly double the cost of material to which he is accustomed and which has given him very good results."

A well-known fertilizer manufacturer on the Pacific Coast reports that more than half of the fertilizer consumed in the west is highly-concentrated nitrogen materials applied directly to the soil without mixing with other products. These materials include sulfate of ammonia, ammonium nitrate, sodium nitrate and organic materials, he says. "Of recent years, a substantial tonnage of anhydrous ammonia 82% nitrogen, ammonium nitrate ammonia liquor carrying an analysis of 40% nitrogen and straight ammonium nitrate liquor carrying an analysis of 20% nitrogen have been applied to the soil or in irrigation water. Pure phosphoric acid, treble superphosphate and high-grade single superphosphate, in substantial quantities, have been applied directly to the soil and are freely sold to farmers.

"There never has been and it is safe to state that there will not be

(Turn to Page 104)

Suppliers' Bulletins

Announces Safety Hood

General Scientific Co., Philadelphia, has announced production of a new safety hood to protect a worker's face, head and neck from possible splashing of toxic chemicals. The new device, coated with rubber, is fitted with a large plastic window for full visibility, and may be worn with respirator or goggles, the makers say. The firm's address is 2700 W. Huntingdon St., Philadelphia.

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Tox. News Digest Out

Hercules Powder Co., Wilmington, Del., has recently published its March issue of *Toxaphene News Digest*, containing information on insect control, spray materials, with particular emphasis on boll weevil control. Copies are available from the company, 970 Market St., Wilmington, Del.

•

Offers Retaining Strips

Signode Steel Strapping Co., Chicago, has developed "Duplex Retaining Strips" for protection to goods being shipped in freight cars. The feature of the device is its ability to be put in place before loading the car, then severed and draped out of the way while loading takes place. When loading is completed, the ends of the severed strips are brought together, overlapped, tensioned and sealed in one operation. Literature is available from the company, 2649 N. Western Ave., Chicago 47, Ill.

•

Offers Toxaphene Booklet

Hercules Powder Co., Wilmington, Del., has issued a bulletin covering current state and federal recommendations on how to use and apply toxaphene. (as of January 1, 1950) The information includes the names of insects which may be controlled by the product; the rate and method of application, and general remarks regarding special precautions and instructions. Copies of the bulletin are available from the company, 970 Market St., Wilmington 99, Del.

•

New Hough Machine

Frank G. Hough Co., Libertyville, Ill., has announced a new half-yard "Payloader" for use in handling bulk materials both inside and out of industrial plants. Designated as model "HE," the new machine has a full-reversing transmission, with forward-reverse control separate from the regular gear shift. This system, according to the makers, assures speedy shifting into reverse and speed in reverse, adding to the over-all maneuverability. Full dumping clearance of 91 inches is provided for easier loading, and it can dump loads slowly or abruptly as desired. Descriptive literature is available from the manufacturers, 875 Sunnyside Ave., Libertyville, Ill.

"Ryania" Booklet Out

S. B. Penick & Co., New York, has published a booklet on "Ryania" insecticides for control of European corn borer and sugar cane borer. The booklet contains a complete history of the insecticide, describes the toxicology, pharmacology and chemistry of the product, and reports on numerous laboratory tests. Write to S. B. Penick & Co., 50 Church St., New York 7, N. Y. for a copy.

•

Dow Offers "Premerge"

Dow Chemical Company, Midland, Mich., has announced that a new pre-emergence weed killer called "Premerge" is being tested this spring on cotton and other large seeded crops such as peanuts, beans and corn, on plantings of corms, bulbs, and tubers, and on asparagus.

The new product is said to appear promising after considerable experimental work, Dow reports, and it is being tested this spring on a field scale under the direction of State Experiment Stations and the technical service and development division of The Dow Chemical Company. The product will not be available commercially this year.

"Premerge" contains the amine salt of dinitro-o-sec-butylphenol and is a residual pre-emergence type weed killer. Germinating weed seedlings are killed or checked by the chemical for several weeks when it is applied to the soil immediately after planting.

•

Wyo. Issues 59th Repor

Wyoming Agricultural Experiment Station, Laramie, has just issued its 59th annual report for 1948-49. The book reports that efforts to control horn-flies have been successful with DDT and "Methoxychlor." Figures were as follows: Methoxychlor, 1.5%, ranged 28 to 41 days in effectiveness and averaged good control for 33 days. DDT, 1.5% ranged 19 to 45 days with an average good control for 36 days. DDT at .5% averaged 21 days of fair control.

Weed control experiments over a period of two years indicate that at least 2 pounds of 2,4-D per acre over a period of years, is necessary to gain control of Canada thistle. Control of white top, however, has proved less difficult but still requires at least 2 pounds of 2,4-D per acre for a period of two years, the report indicates.

Weather plays an important part in the activities of the Wyoming station, the report states, with temperatures in the state ranging from a high of 105° to a low of 48° below zero. Average precipitation in the state was 12.86 inches for the period.

Station agronomists indicate that the hay harvest in Wyoming might be doubled or even trebled, with a program of fertilization and other cultural practices which would include leveling, reseeding, control of water, etc. Greenhouse experiments are being made with various commercial fertilizers to determine the best combinations under Wyoming conditions, the report states.

Shell Research Expanded

A record research program for Shell Oil Co. during 1950 has been announced. The over-all cost of the program will be $1,500,000 per month, the company says, with a considerable portion of this sum being allocated for the development of agricultural chemicals. Most of this work will be done at the company's 142-acre test farm and laboratory at Modesto, Californai, where experiments are conducted in soil fertilization, control of insects, weeds, and plant disease. This laboratory serves as a proving ground for petroleum-derived chemicals such as insecticides, fungicides and spray oils.

•

2 New DDT Products

Michigan Chemical Corporation, Saint Louis, Michigan, has announced the addition of 75% DDT wettable powder and 75% DDT dust concentrate to its line of agricultural chemicals. The new wettable powder formula carries a higher concentration of DDT than has been available in this type of product heretofore.

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TECHNICAL BRIEFS

(Continued from Page 52)

DDD emulsion was used in combination with DDT, "Fermate" and "DN-111" also without injury this year.

3. "Arathane" in combination with parathion, methoxychlor ("Marlate") "Rhothane" emulsion, "Rhothane" wettable powder and "Fermate" caused no injury.

4. No injury resulted from "DN-111" used with "Rhothane" emulsion, methoxychlor ("Marlate"), toxaphene and "Fermate."

5. A summer spray oil, "Superla," with DDT caused severe injury and heavy leaf drop on Golden Delicious followed closely in severity of injury following use of "Superla" with "Rhotane" powder. Injury was somewhat lighter from a "Superla"-methoxychlor ("Marlate") combination and no injury to a mere trace occurred where "Superla" and Toxaphene were used together.

—H. G. Swartwout, in University of Missouri College of Agriculture Bulletin.

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Soil Defroster Tried

Experiments with carbon black have indicated that the temperature of soil may be raised by mixing the material with soil, the American Chemical Society has announced. Since carbon black absorbs heat, it is mixed with the soil to a depth of about two inches with the result of raising the soil's temperature both on the surface and two inches lower.

When an economical and practical process can be employed, it is indicated that land may be "defrosted earlier in the spring, and fall frosts may be delayed somewhat.

The experiments were carried out by Prof. John Everson of the University of Massachusetts and J. B. Weaver of Godfrey L. Cabot, Inc., Boston firm which manufactures carbon black.

OAK TREES

(Continued from Page 64)

lesions. It was estimated that less than 1 percent of the lesions were active on trees receiving 1 ppm of "Acti-dione." Many active lesions were present on trees sprayed with the other fungicides; of these copper ("Tennessee 26") appeared to have the strongest eradicative and protective properties.

Trees sprayed with "Acti-dione" were markedly green when compared with those sprayed with the other fungicides and were holding a greater percentage of their leaves on October 4, when non-sprayed trees were completely defoliated.

In these trials, "Acti-dione" appeared to have exceptional eradicant action on the cherry leaf spot fungus, without injury to the foliage. As the spray was applied after fruit was picked, no information was obtained of the effect of "Acti-dione" on the fruit.

Blue Mold of Tobacco

TOBACCO blue mold is again active this year. It was observed in a new seedbed in Cook County, Georgia, on January 21 and reported as early as the first week in January in the same area on holdover tobacco plants. By early February it was found in an old bed of cigar-wrapper plants near Quincy, Florida, and widespread in Alachua County, Florida.

By middle February the first outbreak of blue mold was reported in South Carolina in Marion County. At about the same time it was found in the southern tier counties of North Carolina, namely, Robeson, Columbus, and Bladen.

Dry weather with above normal temperatures prevailed over this eastern and southern area during December 1949 and in January 1950 temperatures were reported much above normal with light precipitation in the affected areas. In some cases lack of sufficient moisture for germination resulted in poor stands. With the reported warm weather with frequent foggy days and nights in early February, conditions for disease development were unfavorable. Very little general infection was noted and where the larger plants in a seedbed were affected, growers started spraying and dusting to protect the surrounding small seedlings in the two-leaf stage. Adequate supplies for treating were in the hands of distributors and there was much interest among growers in treating to control blue mold. The peak of disease activity, of course, has not been reached and results of control cannot as yet be appraised.

L. I. SCHOOL

(Continued from Page 45)

soil problems, the handling of research data and research procedures. A considerable portion of the summer months are spent in the performance of plant protection practices. As part of the requirements, students select

Phygon-XL

APPLE SCAB CONTROL

An improved Phygon formulation with controlled particle size for control and eradication of Apple Scab.

During the 1948 and 1949 seasons, Phygon-XL, used at ½ lb. per 100 gallons of water gave outstanding scab control, and good yields of U. S. No. 1 fruit in commercial orchards.

Phygon-XL is compatible with Lead Arsenate, DDT, Chlordane and Rotenone wettable powders.

PHYGON-XL ALSO CONTROLS

BLOSSOM BLIGHT OF PEACHES
BROWN ROT OF PEACHES
CHERRY LEAF SPOT
CORYNEUM BLIGHT
PEACH LEAF CURL

UNITED STATES RUBBER COMPANY

Naugatuck Chemical Division

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and work on a research problem of their own, and report on it during the last three semesters of school.

That graduates of the school are well received by industry, is indicated by Dr. Pyenson, who states that many are now working as research assistants in state experiment stations; as laboratory technicians with companies dealing in agricultural chemicals; and as sales and service men with agricultural companies and dealers in insecticides, fungicides, weed killers and application equipment. Dr. Pyenson also adds that a dozen graduates of the agricultural chemical curriculum will be available early in June, for placement in the field.

INSECTICIDES

(*Continued from Page 41*)

use of N-2 ethyl hexyl imide of endomethylene-tetrahydrophthalic acid* as a synergist, so that the combination was more effective than natural pyrethrins. This combination also shows considerable promise for the control of other insects such as stored grain insects, flies and others. Two homologs of "264" also showed similar results.

Another material has been announced recently under the name "Sulfoxyl" which is N-octyl sulfoxide of isosafrole. This material shows promise as a synergist for natural pyrethrins.

* Compound 264 mentioned previously.

OIL HERBICIDES

(*Continued from Page 34*)

by entomologists. Oils had been found to be very effective for the control of certain insects but the plants or trees were also frequently injured. Gray and De Ong (4) studied the phytotoxicity of 35 petroleum distillates as related to "unsaturation" as indicated by a sulfonation test (solubility in concentrated sulfuric acid), density, flash, viscosity at 68°F., and capillarity on a crayon. The toxicity of the oils tested appeared to be roughly proportional to the "unsaturated" (olefinic and aromatic) compounds present.

De Ong, Knight, and Chamberlin (3) observed two distinct types of injury, acute and chronic, to citrus trees by petroleum oils. They found that the former is caused by low boiling and the latter by high boiling oils.

Tucker (8) found that apricot leaves smeared with oils containing from 25 per cent to 50 per cent unsaturated compounds and with viscosities between 65 and 400 seconds at 100°F. showed a toxic effect after 2 or 3 days in sunlight, but were unaffected when shaded. The toxic effect was attributed to the formation of "asphaltogenic" acids in sunlight. Medicinal mineral oil and other water white oils with a viscosity greater than that of kerosene and containing no appreciable amounts of unsaturated compounds were nontoxic over long periods of time.

Crafts and Reiber (2) confirmed these findings of the entomologists in an extensive study of oils as herbicides. The relationship between chemical constitution and toxicity was also established more firmly by these authors by tests with pure compounds. Paraffinic compounds were the least toxic of those studied. Naphthenic compounds were found to be toxic and the toxicity of aromatic compounds increased with the degree of substitution, i.e., the number and length of side chains replacing the hydrogen atoms of the benzene nucleus. The aromatics studied ranged from benzene itself to the propyl benzenes; tetraisopropyl benzene, with four three-carbon atom side chains being the most complex and most toxic compound reported.

Havis (5) in a study of thirty-one pure hydrocarbons found that aromatics were more toxic than olefins, which, in turn were more toxic than paraffins. The straight-chain paraffins were least toxic. The cycloparaffins, especially the double ring naphthenes, were markedly more toxic than the straight chain paraffins. In general, the hydrocarbons included in the boiling range from 300°F. to 525°F. were more toxic than those on either side of that range.

It is seen from the foregoing that phytotoxicity of petroleum herbicides can be determined within broad limits by the determination of a number of physical and chemical properties. Very little work has been reported dealing with the fundamental mechanics of toxicity, partly because the emphasis of industrial workers has been placed upon the commercial development of the herbicides, and partly because of the extremely complicated and delicate experimental procedures required to trace the progress of the herbicide into the plant cells and to analyze the end products of the reaction. The living protoplasm is a mass of matter wherein delicately balanced chemical and physical changes proceed constantly. The income and outgo of materials are controlled by the permeability of the ectoplasm. The metabolism is a series of chemical reactions catalyzed by enzymes. Anything that upsets the balance either of the permeability or the metabolism will convert the protoplasm nonreversibly into a disorganized mixture of dead materials.

The weed killing oils wet the waxy surfaces of leaves much more effectively than water. They penetrate the cell walls and come into direct contact with the protoplast. In that position they may (1) alter the permeability of the ectoplast, permitting the water to escape or (2) they may penetrate to the interior of the protoplast and combine either physically or chemically with the constituents.

Future fundamental research would be most valuable in establishing the action of toxicity. This would enable the formulation of definite specifications for weed killers, and assist in "tailoring-making" herbicides for specific weed problems.

(*Part II Will Appear in May*)

E. B. Twyman in N. Y.

E. B. Twyman, president of John Powell y Cia., Buenos Aires, Argentina was in New York recently on his annual visit to the offices of the parent company, John Powell & Co., New York. In an interview with the editor of *Agricultural Chemicals* he reported that his prediction made in these pages several years ago that South America would become a vastly expanded market for agricultural insecticides is rapidly being realized. Consumption of agricultural insecticides in South America, he estimated, has increased four to five hundred percent in the past four years, as potential users have become more insecticide conscious and more familiar with the important role of agricultural chemicals in modern agricultural practice.

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Fertilizer Buries Worker

A foreman at the Logan-Robinson fertilizer plant, Charleston, S. C., was killed March 23, when a 16-ft. high pile of fertilizer material suddenly collapsed and fell on him. The plant superintendent E. W. Weekley, narrowly escaped the same fate when the material covered him to the waist.

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Gets Fertilizer Bag Job

Union Bag & Paper Corp., New York, has announced the appointment of C. L. Reynolds as Control Manager.

Industry Patents

2,497,101. METHOD OF SPRAYING. Patent issued February 14, 1950, to Donald F. Starr, College Park, Md., dedicated to the free use of the People of the U. S. A method of depositing DDT comprising forming a water spray, independently thereof, forming a spray of a solution of DDT and intermixing the sprays, thus causing the DDT solution to be dispersed throughout the droplets of water immediately prior to depositing of the spray.

2,497,294. INSECTICIDAL COMPOSITION. Patent issued February 14, to Leonard C. Cartwright, New York, assignor to Foster D. Snell, Inc., New York. A liquid composition suitable for use in forming a hard non-tacky insecticidal film comprising 2,2,-bis(p-chlorophenyl) 1,1,1-trichlorethane serving as the insecticide, a water insoluble cellulose ether of an aliphatic alcohol containing 2 to 4 carbon atoms to the molecule serving as hardening agent, a resin selected from the group consisting of coumarin-indene resin, terpene resin, ester gum, polymerized ester gum and maleicized ester gum, and a volatile solvent medium for the insecticide, hardening agent and resin, proportions by weight of the non-volatile ingredients being 0.5 part to 2.5 parts of the resin, 0.1 to 0.5 part of the cellulose ether and 5 parts of the insecticide.

2,497,927. RESINOUS FUNGICIDAL COMPOSITIONS. Patent issued February 21, to Herman A. Bruson, Rydal, Pa., assignor to Rohm & Haas Co., Philadelphia. A resinous fungicidal agent comprising the product of copolymerizing substantially equimolar amounts of an anhydride from the class consisting of maleic and chloromaleic, anhydrides and an ether having the general formula

$$Ar—(O—CH_2CR=CH_2)_n$$

in which R represents a member of the class consisting of a methyl group and a hydrogen atom, n is a whole number having a value of one to two, and AR is a chlorinated aromatic hydrocarbon radical of the benzene and naphthalene series containing one to five halogen atoms.

2,490,958. PEST-COMBATTING COMPOSITIONS AND SPRAYING LIQUIDS OF ENHANCED ADHERING CAPACITY. Patent issued to Charles Graenacher, Riehen, and Max Matter, Basel, Switzerland, assignors to Ciba Ltd., Basel, Switzerland. A composition of matter suitable for the preparation of a spraying liquid, containing as its essential ingredients a pest-combatting agent selected from the group consisting of insecticides and fungicides which are sparingly soluble to insoluble in water, an aminoplastic consisting of a hardenable reaction product of formaldehyde with a member of the group consisting of urea, thiourea, cyanamide, dicyandiamide, dicyandiamidine and melamine, and a hardening accelerator consisting of an ammonium salt of a strong acid, the said aminoplastic being present in a proportion amounting to at least 8 per cent and the hardening accelerator being present in a proportion insufficient to damage horticultural products to which the spraying liquid may be applied but in an amount of at least 4 per cent, both percentages being calculated relative to the total content of non-aqueous constituents of the spraying liquid to be prepared therefrom, which composition gives a spraying liquid having a pH-value of at least 5

2,498,302. PREVENTION AND DESTRUCTION OF WEEDS. Patent issued February 21, 1950, to W. A. Sexton, Manchester and R. E. Slade and W. G. Templeman, Bracknell, England, assignors to Imperial Chemical Industries, Ltd. A composition suitable for the destruction and prevention of weeds containing (1) an active herbicidal compound, in amount sufficient to exert herbicidal action, from the group consisting of (*a*) benzoyl-o-benzoic acid, (*b*) 4'-chloro-2-benzoyl benzoic acid, (*c*) 4'-methyl-2-benzoyl benzoic acid, and (*d*) the water-soluble salts of said acids and (2) a non-phytocidal, dry, pulverulent solid which does not decrease the fertility of soil.

2,498,480. METHOD OF PREPARING FERTILIZER CONCENTRATE. Patent issued February 21, to K. G. Bierlich, W. Palm Beach, Fla., and E. O. Whiteley, New York. A method of preparing a fertilizer concentrate which comprises immersing cellulose refuse containing gums and resins in a solution of a saponifying agent associated with finely divided bentonite clay in aqueous suspension at ordinary temperatures to form a slurry of the mixture, then washing the product to remove the resulting aqueous soapy mixture, drying the residue and thereafter impregnating said residue under super atmospheric pressure with a solution of fertilizer and finally drying the product.

2,499,396. PARASITICIDAL SYNERGISTIC COMPOSITION OF BHC AND 2,4-DINITRO-PHENOLS. Patent issued March 7, 1950, to George E. Lynn, Midland, Michigan, assignor to Dow Chemical Co., Midland. A parasiticidal composition including as active toxicants benzene hexachloride and one of the group consisting of the hydrocarbon-substituted 2,4-dinitrophenols and their salts, and wherein the mixture of toxicants exerts a synergistic effect as regards parasiticidal toxicity.

2,499,992. INSECTICIDE COMPOSITION COMPRISING DI-(MONOCHLOROPHENOXY)-METHANE AND 1,1-DI-(MONOCHLOROPHENYL)-ETHANE. Patent issued March 7, 1950, to Curtis E. Dieter and Oscar H. Hammer, South Haven, Mich., assignors to Dow Chemical Co., Midland. An insecticidal composition comprising as mutually activating toxic ingredients equal parts by weight of 1,1-di-(monochlorophenyl)-ethane and di-(4-chlorophenoxy)-methane.

2,499,002. EMULSIFIER AND METHOD OF MAKING SAME. Patent issued February 28, 1950, to Thomas Robinson, New York and Carolton H. Bascom, Richmond, N. Y., assignors to Lancaster Processes, Inc., New York. A method of making an emulsifying agent, which comprises preparing an alkaline dispersion of clay in water and adding said dispersion to a boiling solution of an aluminum salt in the presence of sufficient alkaline material to precipitate the aluminum as a hydrated gelatinous precipitate.

Trade Mark Applications

DI-TICK, in Ultra-Bodoni capital letters, for liquid or powder insecticide preparation used to destroy, repel and control ticks and fleas on horses, sheep, hogs, cattle and other domestic animals. Filed March 23, 1945, by Belco Chemical Products Co., New York. Claims use since Jan. 10, 1945.

RAMCO, in capital letters arranged as a cross with the letter "M" serving for both the horizontal and vertical words, for insecticides. Namely: insecticide powder, liquid insecticide with DDT and antiseptic insecticide; disinfectants for general use, cattle fly spray and rodenticide. Filed Aug. 2, 1948, by Sterling Jones Laboratories, doing business as R. A. Myers & Co., St. Paul, Minn. Claims use since Jan. 1, 1929.

PLANTERS, in heavy capital letters, for agricultural insecticides and fungicides. Filed Sept. 22, 1948, by Planters Chemical Corp., Norfolk, Va. Claims use since 1930.

KUHLS, in heavy capital letters, for preservative. Namely: a fungistatic and insecticidal preservative for the control of decay, blue and black stain, mould, mildew and insects in wood. Filed July 14, 1948, by H. B. Fred Kuhls, Brooklyn, N. Y. Claims use since 1890.

PENFLUOR, in Chelt capital letters, for insecticides. Filed Dec. 17, 1948, by Pennsylvania Salt Mfg. Co., Philadelphia, Pa. Claims use since Oct. 14, 1948.

DEE AITCH, in italic capitals and lower case, for insecticides, fungicides and herbicides for agricultural use and for rodenticides for agricultural and household use. Filed Jan. 11, 1949, by Daly-Herring Co., Kinston, N. C. Claims use since Feb., 1947.

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S. C. Fertilizer Mfgrs. Meet

Some twenty fertilizer dealers and manufacturers met at Kingston, N. C. on March 15 to hear Dr. E. R. Collinsions, S. C. Extension Service agronomy specialist. He explained to the manufacturers and dealers the reasons underlying experiment station fertilizer recommendations in order to acquaint them with the procedure.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 234 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Wanted

Agriculturist: Desires position with firm in export of agricultural chemicals, seeds or allied lines. Former resident Mexico with travels within Republic and Central America. Have contacts through handling exports of agricultural commodities from U.S.A. and Europe. Speak and write Spanish. Address Box No. 427, care of Agricultural Chemicals.

Plant Pathologist: Ph. D.; experience in research and administration. Background in plant physiology and herbicides. Desires position in East or Midwest. Address Box No. 428, care of Agricultural Chemicals.

Positions Open:

Salesman with good chemical background, now calling on insecticide mixers, to sell emusifier on commission basis. This is a proven product now being used extensively in the insecticide industry and would be real money maker for qualified persons in position to handle. Address Box No. 429 care of Agricultural Chemicals.

Experienced salesman wanted for textile bags, burlap and cotton, new and used; also bagging and ties. Several territories open. Apply only if experienced in our line. Mente & Co., Inc., P. O. Box 690, New Orleans 7, La.

Expands Brush Control

Expansion of its chemical brush and weed control division has been announced by the Davey Tree Expert Co. In charge of the division is Homer L. Jacobs, technical services director. Facilities are now offered for destruction of weeds and woody growth in industrial plant areas, along highways and railroad rights-of-way, the company states. Chemicals used comprise largely ammonium sulfamate, 2,4-D and 2,4,5-T. Some three million gallons of ammonium sulfamate alone, were used in experiments to determine the effectiveness of various materials in brush control, the company reports.

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Opens Baltimore Lab.

Raymond C. Crippen has announced the opening of research and development laboratories under his own name, at Baltimore 2, Md. The new laboratories offer analytical, research and development service to manufacturers, users and sellers of agricultural chemical products. A booklet describing the service is available. Address Raymond C. Crippen, Research & Development Laboratories, Baltimore 2, Maryland. Ask for Bulletin #3.

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FERTILIZER REPLIES

(Continued from Page 90)

any pressure on the part of the fertilizer industry to force farmers to purchase low-grade mixtures of fertilizers.

"Buyers of mixed fertilizers can obtain from any fertilizer manufacturer any mixture of fertilizer desired. Year after year we hear the charge that the fertilizer industry will not sell high-grade fertilizers, until the story is worn thread-bare. The record of the industry speaks for itself. The service rendered not only the farmer but also the nation, in the distribution of fertilizers has been outstanding. Commendation, not censure, is due the industry."

R. R. Weeds Discussed

Seven herbicides for use in controlling grass and weeds on railroad rights of way in certain areas were recommended for use to members of the American Railway Engineering Association at their recent 49th annual meeting in Chicago.

As listed in a report of the Committee on Roadway and Ballast these are:

Sodium chlorate-calcium chloride weed killer.
Sodium trichloroacetate-Formula 40 (2,4-D amine).
Sodium chlorate-sodium trichloroacetate.
Sodium trichloroacetate pentachlorophenol.
Sodium arsenite- sodium pentachlorophenate.
Sodium arsenite- Oil "214-A."
Oil "214-A" alone.

Explaining the research program on which the recommendations were based, Jack P. Taylor of the R. H. Bogle Co., manufacturers of agricultural chemicals, Alexandria, Va., said thirty recognized weed killers and combinations were tested under controlled experiments during 1949 but that only these seven "show real merit, within a cost range, for ballast treatment."

Practical field tests were confined to six locations on railroad rights of way in Georgia, Florida, Alabama, Tennessee, South Carolina and Virginia and in all cases consideration was given to soil conditions, effect of weather and time of application.

Analysis of results of all formulations tested, Taylor stated, led to the following conclusion:

"That the most economical chemical herbicide formulation for Johnson grass, Bermuda grass and weeds growing together, was the Sodium chlorate-sodium trichloroacetate combination—two pounds of the former to one pound of the latter (60 percent or equivalent)."

"While conclusions reached could very well apply to other parts of the country where Bermuda and Johnson grass predominate," he added· "we are in no position even to imply that the same conclusion would be applicable where different types of perennial weeds and grasses grow."

Advertisers' Index

APRIL, 1950

(The Advertisers' Index has been checked carefully but no responsibility can be assumed for any omission)

TALE ENDS

RALPH J. Hervey, of the Backland Experiment Station near Temple, Texas, gives a few tips on checking radioactive contamination. After distributing some "hot" fertilizer recently, he took off his rubber gloves and passed a Geiger counter over hands to find a minor amount of radiation there. Then he ran the counter up his arm with no particular results, until the instrument got near his wrist watch. Then the indicator nearly jumped off the dial.

Alarmed, he jerked his watch off and checked the band, fearing some of the material might have lodged there; but there was small response. Then he remembered that the watch had a radium dial!

•

Dr. Roman Vishniac, the entomologist-photographer, was honored by having on display at the American Museum of Natural History, a print and color-transparency show, "Animals in Action" for a month, ending April 2. The pictures showed different "poses" of many agricultural pests, revealing the hardy little critters as tough, hungry and well-armed.

•

A total of 103 years of service with the same company has been achieved by two brothers, Frank and Arthur Ewer who have been with Bemis Bro. Bag Co. since 1896 and 1900, respectively, as reported elsewhere in this issue. This should be a record of some kind from both an individual and a "brotherly" standpoint. It should also impart to younger men the rewards of sticking to a job come what may. Congratulations to the brothers Ewer.

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In his introduction of Dr. S. A. Rohwer at the recent Boyce Thompson Institute of Plant Research meeting on "allethrin," Dr. H. B. McClure, Carbide & Carbon Chemicals Division stated that Dr. Rohwer's middle initial no longer stood for the name "Allen," but rather for "Aerosol," with which he has been working a great deal of late.

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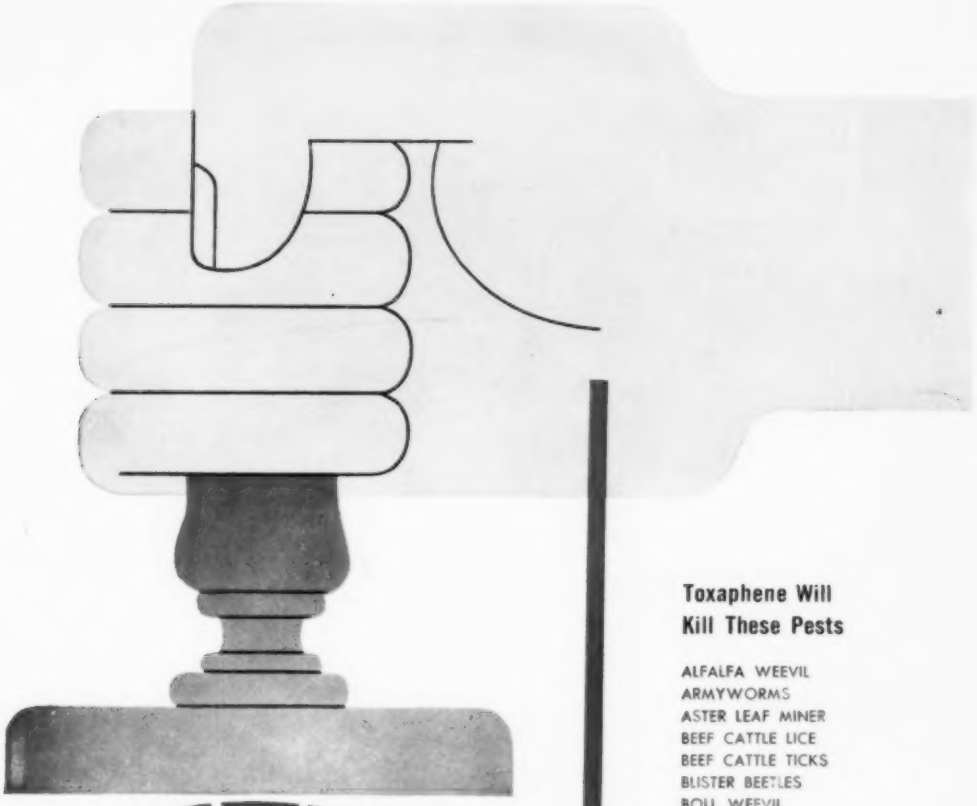

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